

SOI: 1.1/TAS

DOI: 10.15863/TAS

ISSN 2308-4944 (print)

ISSN 2409-0085 (online)

№ 01 (33) 2016

**Teoretičeskaâ i prikladnaâ nauka**

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**Theoretical & Applied Science**

**Perspectives in science for 2016**

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**Philadelphia, USA**

**Teoretičkaâ i prikladnaâ  
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**Theoretical & Applied  
Science**

**01 (33)**

**2016**

# International Scientific Journal

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Founder : **International Academy of Theoretical & Applied Sciences**

Published since 2013 year.

Issued Monthly.

International scientific journal «Theoretical & Applied Science», registered in France, and indexed more than 43 international scientific bases.

Address of editorial offices: Djambyl street 128, 080000, Taraz, KZ.

Phone: +777727-606-81

E-mail: [T-Science@mail.ru](mailto:T-Science@mail.ru)

<http://T-Science.org>

**Impact Factor ICV = 6.630**

**Impact Factor ISI = 0.829**

based on International Citation Report (ICR)

ISSN 2308-4944



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# **International Scientific Journal**

## **Theoretical & Applied Science**

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30.01.2016

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# International Scientific Journal

## Theoretical & Applied Science

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ISPC Perspectives in science for 2016, Philadelphia, USA  
**ISJ Theoretical & Applied Science, 01 (33): 200.**

**Impact Factor ICV = 6.630**

**Impact Factor ISI = 0.829**  
based on International Citation Report (ICR)

ISSN 2308-4944



## Impact Factor:

ISRA (India) = 1.344  
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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Elnur Latif oglu Hasanov**

Corresponding member of International Academy of  
Theoretical and Applied Sciences,  
Ph.D., Senior specialist of Ganja Department  
Azerbaijan National Academy of Sciences,  
Ganja, Azerbaijan  
[l-hasan@hotmail.com](mailto:l-hasan@hotmail.com)

SECTION 12. Geology. Anthropology.  
Archaeology.

### TYPICAL LOCAL FEATURES OF ARCHITECTURE OF GANJA (ON THE SAMPLE OF IMAMZADE TOMB-COMPLEX OF GANJA)

**Abstract:** In this scientific work basic features of historic-cultural traditions of architecture Ganja have been investigated on the basis of different scientific sources and innovative methods.

**Key words:** Azerbaijan, historical-ethnographic research, Ganja, architecture.

**Language:** German

**Citation:** Hasanov EL (2016) TYPICAL LOCAL FEATURES OF ARCHITECTURE OF GANJA (ON THE SAMPLE OF IMAMZADE TOMB-COMPLEX OF GANJA). ISJ Theoretical & Applied Science, 01 (33): 1-3.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-1> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.1>

### TYPISCHE LOKALE MERKMALE DER ARCHITEKTUR DES GÄNDSCHÄ (AUF DER PROBE DES GÄNDSCHÄS GRABSTÄTTE 'IMAMSADÄ' KOMPLEXEN)

**Die Zusammenfassung:** In dieser wissenschaftlichen Arbeit Grundzüge des historisch-kulturellen Traditionen der Gändschä wurden auf der Grundlage von unterschiedlichen wissenschaftlichen Quellen und innovative Methoden untersucht worden.

**Schlüsselwörter:** Aserbajdschan, historisch-ethnographischen Forschung, Gändschä, Architektur.

#### Die Einführung

Die Grabstätte Imamsade, die sich im staatlichen historik-kulturellen Naturschutzgebiet befindet in einem der alttümlichen Zentren der Wissenschaft und der Kultur – die Stadt Gändschä.

Die Grabstätte wurde hier im Jahr 739 über dem Grab des Urenkels Propheten Muhammed – des Sohnes von Imam Ali ibn Hussejn, des fünften Imams Muhammed Baqir und seiner Tochter Umme Hekima - Movlan Ibrahim errichtet. Das Wort "Imamsadä" stammt vom Begriff „Kind des Imams“ und es bedeutet der Nachkomme von Imam.

Unter dem Volk versteht man das Wort „Imamsade“ wie ein heiliger Tempelort.

Während der Herrschaft von Umayyaden (661 - 750) wurden viele Mitglieder Ahl Al-Bait (Nachkommen von Muhammed) verfolgt und an die Ränder des Amirs verjagt. Movlan Ibrahim ist in die Stadt Gändschä damaliges Zentrum der uralten islamischen Kultur umgezogen.

Movlan Ibrahim siedelte in der Stadt Gändschä und lebte bis seinem Tod hier und wurde auch hier begraben. Zum Ehren seiner Heiligen Persönlichkeit wurde über seinem Grab eine Grabstätte errichtet.

#### Materialien und Methoden

Aserbajdschan liegt zwischen Europa und Asien und hat eine günstige natürlich-geographische Konjunktur, mildes Klima, fruchtbare Boden, reiche Bodenschätze. Dieses Territorium ist in der Wirklichkeit als erstes Obdach der menschlichen Zivilisation berühmt. Vor zwei Millionen Jahren gab es hier jede Bedingung für die Bewohnung, Leben, Schaffen, Entfaltung und Fortschritt der Urmenschen.

Gändschä ist eine älteste Ecke der Kultur unseres Landes. Gändschä hat eine Geschichte mindestens 4000 Jahre des muslimischen Orients und hier sind alte Baudenkmäler, Grabmal des Aposlels, ein wertiges Heiligtum. Dieses wichtige Denkmal liegt 7 Kilometer weit vom modernen Gändschä, am rechten Ufer Gändschäflusses. Grabmal Imamsades hält man für die bedeutenden Symbole der Stadt.

Gändschäs Aposlel Grabmal wurde auf das Grab des jungen Prinzen Ibrahim des Sohns des fünften Aposlel Mahammad Bagir, der 739 gefallen war, hinaufgesetzt. Von diesem Denkmal offenbarte sich wichtige historische Quelle der Jahrbücher. Grabmal



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Aposel wurde am Ende des XIV. und am Anfang des XV. Jahrhundert ganz errichtet. In den XVII-XVIII Jahrhunderten wurde herum Moschee, Tempel und andere grabmäler erhöht.

Gändschäs İmamsade grabmal war seit Jahrhunderten zum Heiligtum der Muselmanen, die nicht nur aus Aserbaidshan, sondern auch aus anderen Ländern gekommen waren.

Dieses Ort hat sich in einem heiligen Tempel für gläubigen Muslim verwandelt. Die im VIII Jahrhundert über dem Grab von Movlan Ibrahim gebaute Grabstätte, wurde in den XIV – XVI Jahrhunderten vergrößert, in ihrer Gegend liegenden Gebäuden wurden grundsätzlich in XVII – XVIII Jahrhunderten gebaut. Die Grabstätte ist das wertvollste Denkmal im Imamzadeh komplex. Die Höhe der Grabestn ist 12 m, die Kuppelhöhe ist 2,7 m, Durchmesser ist 4,4m. Die Fassadenplatten sind mit blauen Kacheln bedeckt.

Im XX. Jahrhundert wurde die Innenwand des Innenteils der Grabstätte wichtigste historisch – epigraphische Muster entdeckt und von den hervorragenden Historikern erforscht - verstorbenen Archäologen, Professor Isak Dshäfadä, sowie von einer bekannten Wissenschaftlerin,

Akademikerin Mäschädichanym Nemätova wurden untersucht und werden in folgender Weise gelesen: „Er, der Gott ist ewig. Das ist ein Heiligtum, ein Paradiesgarten von Movlan Ibrahim – Sohn des Imams Mohamad Baqir – sei ihm Ehre. 120 Jahre nach dem Tod seines Großvaters ist er gestorben – „Sei mit ihm Allahs Segen!“.

Infolge der wissenschaftlichen Forschung dieser historischen Schrift wurde es bekannt, dass das Denkmal dem Sohn des Imams über seinem Grab in 738-739 errichtet wurde. Das Ort des Heiligtums Imamzadä ist den Vertretern vom hervorragenden Aserbaidshanischen Dichter und Philosoph Nizami Gändschävis Generation – welche Scheychzamanovs Güte gehalten.

Im XIX. Jahrhundert begann im İmamsade grabmal die Restaurationsarbeiten zuerst vom heldenhaften Truppenleiter und Chans Dschavad Chan, danach 1878-1879 unter der Leitung des generals des zweiten Reiter-muselmanischen Regiments der russischen Armee İsrafil baj Yadigarsade.

### Schlussfolgerungen und Empfehlungen

Der Stolz der heroischen Geschichte von Gändschä - der letzte Chan, Dschavad Chan Zijads Sohn (1748 – 1804), auf seine Anweisung wurden große Restaurierungsarbeiten geführt. In den Jahren 1878 – 1879 wurde durch Initiative des Generalmajors İsrafil bāy Yadigarzadä und am Anfang des XX. Jahrhunderts aus Initiative einer

Gruppe von Intelligenzen das Altarraum Heiligtum wieder renoviert.

In diesem Heiligtum in dem Imamzadäheiligtum wurden Scheychzamanli - Pischnamazzadä, Mirzä Mehdi Nadschi, Mir Säyyid Abbas Aga – Vertreter von Sazzidsgeneration, General – Major İsrafil bay Jadigarzadä und andere bedeutenden Persönlichkeiten begraben.

Das Heiligtum Komplex war jahrhundertlang als Zentrum der Wohltätigkeit für einsame, obdachlose Menschen bekannt. In der ehemaligen UdSSR war nun Imamzadä als muslimischer einzig offenes und funktionierendes Heiligtum. In den 1930 – 1944 Jahren während der sowjetischen Macht wurde von den Hilfsgebäuden Imamzadä Heiligtum als Kinderheim benutzt.

Dieser heilige Ort hatte die vom Krieg gelittenen kleinen Kinder verschiedener Nationen betroffen.

Unser Land, in dem unser größte Lider Hejdär Älijev den Grund der Staatlichen Politik, der Priorität gegründet hatte, hat tiefsten multikulturellem Stamm, Toleranztraditionen und Bewahrung der verschiedenen religiösen, kulturellen und historischen Denkmäler.

Präsident der Souveränen Aserbaidshanischer Republik İlham Älijev, der Nachfolger von großem Lider setzt die kluge, nationale Politik erfolgreich fort.

Er hatte die religiösen, historischen und architektonischen Denkmälern Wiederherstellung und zahlreichen Erlasse und Verordnungen im Zusammenhang mit der Umstrukturierung ausgegeben, unter der Führung der Präsidentin der Heydar Aliyev-Stiftung, gutwillige Botschafterin UNESCO und ISESCO Frau Mehriban Äliyeva verbringende zahlreiche Projekte ist für unsere nationale und kulturelle

Erben ein unersetzliches Muster. Von Präsidenten İlham Älijev wurden in den Jahren 2010-2015 sieben Verordnungen untergeschrieben. Die religiöse und historische Komplex Imamzadeh wurde in Ganjas Architekturstil erheblich umgebaut.

Heute ist Imamzadeh Komplex einer von besten Heiligtümern der islamischen Welt, und nicht nur für zahlreiche einheimische sondern auch für viele ausländische Pilger besuchte heiliger Ort.

Am 1. März 2010, am 30. Dezember 2011, am 5. Juni 2013, am 16. Mai 2014, am 5. November, am 9. April und am 9. Septembere 2015 hat der Präsident der Aserbaidshanischen Republik Heer İlham Aliyev für die Restauration, Wohlordnung und Einrichtungsarbeiten des İmamsade grabmals komplex, das in der gegend Gändschäs Staatlichen Schonung der geschichte und Kultur liegt, eine Anordnung getroffen.

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### Elnur Lətif oğlu Həsənov

Die Aserbaidshänische Nationale Wissenschaftliche Akademie  
Die Gändschänischen Wissenschaftlichen Abteilung (Filiale),  
Vorgesetzte Spezialist, Korrespondierendes Mitglied der Internationalen Akademie  
der theoretischen und angewandten Wissenschaften  
Gändschä, Aserbaidshän  
[l-hasan@hotmail.com](mailto:l-hasan@hotmail.com)





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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Rezvan Torabi**

Assistance Professor in Islamic Azad University,  
Dehaghan Branch, Department of finance,  
Esfahan, Iran  
[torabi.economic@gmail.com](mailto:torabi.economic@gmail.com)

**Hamid Bozorgzadeh**

Master of finance in Islamic Azad University,  
Dehaghan Branch, Department of finance,  
Esfahan, Iran

**SECTION 31. Economic research, finance,  
innovation, risk management.**

## A SURVEY OF THE IMPACT OF DIVERSIFICATION ON FINANCIAL STABILITY OF BANKS

**Abstract:** Ownership structure in existing private banks in TSE can change diversification degree by changing management structure in market and by approving different rules of credit risk, can affect financial stability of bank. Despite the wide researches about the relationship between diversification degree and stability, most aspects of this relationship are not recognized due to various factors. Thus, investigation of the relationship between diversification degree and ownership structure and financial stability of banks listed on TSE is of great importance and this is one of the unknown aspects of this study. The study population of this research is existing banks in TSE during 2008-2014. The study method is descriptive-analytic and evaluation models and panel data are used. As the results of Hausman test and insignificance of statistics are used, random effects method is selected. F Limer's test shows the support of panel data method. The present study is composed of two main regression, the first is performed by herfindahl hirschman index in payment of loan and second is performed by coefficient of concentration 3 of first bank in deposits. The results showed that the higher the concentration of payment of loan market and as payment loans are in specific minority, the delayed payment of bank and financial instability of banks are increased. This means that the higher the competition in loans payment, the higher the clarity, the lower the financial instability. Also, the results show that concentration among the banks and exclusion among the banks has negative effect on financial stability of banks. Also, the results show that the higher the banks exclusive ownership in stock market, and the higher the sum of shareholders above 5%, the lower the financial instabilities and delayed payment.

**Key words:** Diversification degree, Ownership structure, financial stability, Banks listed on TSE.

**Language:** English

**Citation:** Torabi R, Bozorgzadeh H (2016) A SURVEY OF THE IMPACT OF DIVERSIFICATION ON FINANCIAL STABILITY OF BANKS. ISJ Theoretical & Applied Science, 01 (33): 4-10.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-2> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.2>

### 1- Introduction

Delayed payment as one of the credit risk and financial instability indices is one of the most important challenges of banks in the country. In recent years, despite giving deadline and installment and transferring non-current claims to the current title, delayed payments are increased. Due to various effective factors on delayed payment, the researches in this field are developed. In recent years, new literature is raised in the effect of concentration and competition on financial stability of banks. Competition is a positive force in most industries and is supported by authorities due to positive impact on efficiency of industry, production quality and innovation. This issue has been a challenging case in banking industry. The benefits of competition should cover instability risk of banks. In recent years, based on approving the law of establishment of non-state

banks in Iran, the number of banks is increased and concentration in banking is reduced considerably. In case of not considering its outcomes in financial stability of banks can have dangerous outcomes for bank system and entire economy.

On the other hand, ownership structure in existing private banks in TSE can change management structure and diversification in market and by approving different rules can affect credit risk and financial stability of bank. Thus, evaluation of diversification degree and ownership structure and financial stability of banks listed on TSE is of great importance and this is one of the unknown aspects of this study.

Despite the wide studies regarding the relationship between diversification and stability,



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most aspects of this relationship are unknown due to various factors. Different theoretical and empirical studies have presented different results and theories in this regard. The dominant assumption among politicians and academic experts is the relationship between diversification and stability. This study attempts to evaluate the relationship between diversification and financial stability of Iranian banks and measures its direction and intensity. The validity of each of theories regarding the relationship between diversification and stability about Iranian banks is tested empirically and by panel data model, we investigate the relationship between non-current claims of Iranian banking system as financial instability index and macro-economic factors, systematic risk, Inverse Herfindahl-Hirschman Index as diversification degree and specific features of bank during 2008-2013.

## 2- Theoretical basics

### 2-1- Concentration and competition

Concentration is a condition in market in which the market is controlled by a few pioneer manufacturers active in the industry. The inclusion criteria are effective factors on market concentration and show the easy or difficult condition of entering a market. The higher the difficulty of entering an industry for new enterprises, the existing enterprises can take non-competitive behavior. In an exclusive market, concentration is high and in full competition market, concentration is reduced. Market concentration indicates the condition of number of enterprises and market distribution among existing enterprises in the market. The higher the unfair nature of enterprises, the higher the concentration and if all the conditions are fixed and number of enterprises are increased, the lower the concentration (Economic studies office, 2008). To judge about the competition and exclusion in market, a logical method is to consider the number of active enterprises in market and second the distribution method of market among them. The higher the dedicated section of market to a few enterprises, the closer the market structure to exclusion.

We should consider that concentration and competition are not equal exactly. According to the economists, reduced concentration can increase competition. Thus, concentration is a criterion to evaluate competition degree. Indeed, the difficulties of measuring exclusive power have obliged most researchers to consider the size and distribution of active enterprises in an industry and in literature, it is called "concentration. Structure-conduct-performance (SCP) approach of Mason (1939) and Bain (1951) predicts that when many enterprises exist in market, they are less concentrated and

competition is higher but none of them can be a reason to support the competition increase. Some empirical studies have defined a direct relationship between concentration and market power in banking industry. Others lead to uncertainties in general power of this relationship. In bank system of EU in 1990, the number of banks in Italy was reduced 20%. Despite the structure-performance index, inter-bank competition is improved considerably (Hamidi Sahne, Mehdi, 2008). Bakker, Jacob A. & Haaf, Katharina (2002) studied the relationship between competition and market structure in 23 industrial countries during 10 years. In their study, competition was measured by Panzar-Rosse model and concentration by HHI and CRk criteria in local, national and international markets. Their results supported the traditional view by which concentration could be problematic in competition conditions (Baker and Haff, 2002).

### 2-2 Review of Literature

Rishi Manrai, Rudra Rameshwar and Vinay Kumar Nangia (2014) in the study "Does Diversification Influence Systematic Risk and Corporate Performance? Applied Herfindahl Index as inverse diversification index and to estimate panel method, Eviews software was applied. The results of study showed that there was a significant association between some variables as diversification strategy, capital structure, systematic risk, company profitability, firm size and growth of great companies.

Yigit and Anil (2012) in a study "the effect of management and ownership structure on behavior diversification: a study regarding business of selected companies in stock market of Istanbul" stated that based on the studies regarding the relationship between ownership percentage in preference of various strategy in developed countries, we could say there was a negative association between diverse strategic behaviors and ownership percentage. This study applied agency theory and herfindahl hirschman index and it was evaluated whether there is an association between executive structures and diverse strategic preferences of 359 selected companies in Turkey during 2005-2009 or not. The results showed that the studies companies had diverse ownership percentage. The findings showed that considering ownership percentage was increased compared to business percentage in mentioned companies.

Ruiz-Mallorqui & Santana-Martin (2011) in a study analyzed the effect of control by major institutional owners (bank institutions and investment mutual fund) on company value. They considered the voting right of major institutional owners and other great shareholders. The results showed that when

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major shareholder is a bank, there is a negative association between voting right of owner with company value. This relationship was positive for mutual fund. The results showed that other great shareholders when a major institutional owner controlled the company affected the company value.

### 3- Theoretical framework and study model

This study is applied in terms of purpose and descriptive-analytic in terms of study method. To collect data of review of literature, library method as books, journals, papers, thesis are used and to estimate model, panel data method is used.

Thesis is composed of two main regressions, the first is performed by herfindahl Hirschman index and the second is performed by concentration coefficient 3 of the first bank. The study method is panel data model.

$$1- NPL_{i,t} = \beta_0 + \beta_1 NPL_{i,t-1} + \beta_2 HHI_t + \beta_3 HHI_t^2 + \beta_6 RInt_t + \beta_8 GDPG_t + \beta_4 ERR_t + \beta_5 CR_t + \beta_9 SIZE_{i,t} + \beta_{10} OS_{i,t} + \varepsilon_{i,t}$$

$$2- NPL_{i,t} = \beta_0 + \beta_1 NPL_{i,t-1} + \beta_2 CR3_t + \beta_3 CR3_t^2 + \beta_6 RInt_t + \beta_8 GDPG_t + \beta_4 ERR_t + \beta_5 CR_t + \beta_9 SIZE_{i,t} + \beta_{10} OS_{i,t} + \varepsilon_{i,t}$$

In this study, the relationship between introduced variables is investigated by panel data regression.

#### Study variables

Dependent variable: Dependent variable of study is delayed payment to total loans as recognized as the financial stability criterion.

Explanatory variable: Explanatory or independent key variable in this study is market concentration criterion. These criteria include herfindahl Hirschman index for loan market and concentration ratio 3 of first bank of deposits as structural criteria of competition.

Another explanatory variable is ownership structure as considering total shareholders above 5%.

Control variables: Control variables include three general classifications as macro economy factors, systematic risk and specific features of each bank.

Macro-economic factors include interest rate, goods index growth and services as inflation index and actual GDP.

Systematic risk factors include country risk and exchange rate risk. Country risk is computed by international risk evaluation institutions as S&P, ECR, etc. Exchange rate risk is obtained by actual exchange rate changes.

Special features of bank include banks size as measured by assets share of each bank of total assets of bank system. In addition, dummy variable of bank ownership like Allen Berger et al., (2009) enters into model as control variable.

### 3-Model estimation

To show whether using panel data in model estimation is efficient or not, F Limer's is used and to define which method (fixed or random effects) is suitable for estimation (determining fixed or random nature of cross section units), Hausman test is used. The results of tests are shown in Table 1.

Table 1

#### Results of F-Limer test.

Supported method	Error level	Statistics
Panel data model	0.000	35.546

As shown, the results show rejecting H0. Thus, panel data model with fixed effects is supported. To select among panel data with fixed effects and

random effects model, Hausman test is applied. The results of this test are shown in Table 2.

Table 2

#### Results of Hausman test.

Probability	Degree of freedom	Chi-square statistics	Test results
0.15	9	1.99	Random effects

As shown, the results show rejection of H0. Thus, panel data model with random effects is not

rejected. Finally, based on F-Limer test results and Hausman test, the study model is estimated by panel

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data model with fixed effects of equation 1. The results of test are shown in Table 3.

Based on the results of F-Limer test and Hausman and results of classic regression

assumptions, Model (1) of study is estimated by panel data as fixed effects. The results of model estimation are shown in Table 5.

**Table 3**

### Results of first hypothesis test by random effects method.

Impact type	Significance coefficient	T statistics	Coefficient	Variable	
Positive	0.0001	7.2543	0.453566	Intercept	C
Positive	0.0403	3.7464	0.0987	Delayed payment	$NPL_{i,t-1}$
Positive	0.0011	9.8654	0.9882	herfindahl index	$HHI_t$
Negative	0.0182	2.1345-	0.4567-	Total shareholders above 5%	$Own$
Positive	0.0261	2.7644	1.7678	Interest rate	$RInt_t$
Negative	0.0033	6.8654-	0.4566-	GDP	$GDPG_t$
Positive	0.0058	5.4366	2.0987	Exchange rate risk	$ERR_t$
Positive	0.00332	2.8755	0.56779	Country risk	$CR_t$
Negative	0.0043	9.8357-	1.07665-	Bank size	$SIZE_{i,t}$
Positive	0.0054	7.6543	2.7889	Ownership dummy variable	$OS_{i,t}$
Durbin-Watson statistics :1.87		Coefficient of determination ( $R^2$ ) 0.64		Adjusted $R^2$ :	
		0.72			
		Limer F= 32.841	Prob F :0.00		

Source. Study findings

$$NPL_{i,t} = \beta_0 + \beta_1 NPL_{i,t-1} + \beta_2 CR3_t + \beta_3 CR3_t^2 + \beta_6 RInt_t + \beta_8 GDPG_t + \beta_4 ERR_t + \beta_5 CR_t + \beta_9 SIZE_{i,t} + \beta_{10} OS_{i,t} + \varepsilon_{i,t}$$

Based on coefficient of determination, the model has good fit and the applied variables show explanatory power of model as 72% and it is a good value as the applied method is panel data. Durbin-Watson show the lack of auto-correlation and it shows 1.87. F statistics in this fit rejects zero value of coefficients. The sign of coefficients is presented based on theoretical basics and as coefficients probability shows the effect of all applied variables in this study and their significance.

The results are separated as followings:

The results show that explanatory variable effect or key independent variable in this study is

market concentration and these criteria include herfindahl hirschman index for loan market and the effect on financial instability index (delayed payment) is positive and significant. The results show that the higher the concentration of payment of loan market and the paid loans are on specific minority, delayed bank payment and financial instability of banks are increased. This means that the higher the competition in loan payment and the clarity is increased, the lower the financial instability.

Also, the results show that concentration among the ownership of banks and ownership exclusion among banks has negative effect on delayed payment. In other words, the higher the competition between the ownership of banks, this competition leads to the increase of financial instability of banks. The results show that the higher the exclusion of banks ownership in stock market and the total of



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shareholders are above 5%, the lower the financial instabilities and delayed payment of bank.

The results show that the effect of macro-economic factors include interest rate and growth of goods price index and consuming services as inflation index has positive and significant effect on financial instability of banks and actual GDP rate has negative and significant effect on financial instability index of banks. This means that by increase of interest and inflation rate, risk is imposed on production and company bankruptcy is increased and delayed payment and financial instability are increased. But production increase can reduce production risk and delayed payments are reduced and financial instability is reduced.

The results show that systematic risk factors including country risk and exchange rate risk have positive and significant effect on financial instability. This means that country risk is computed by international risk evaluation institutions as S&P, ECR, etc. and exchange rate risk is obtained by actual exchange rate changes and production risk is increased and delayed payment and financial instability are increased. The results show that

specific features of bank including bank size have negative and significant effect on financial instability. These results show that increase of assets share of each bank of total assets of bank system can lead to optimism of customers and reduced credit risk and financial instability of banks.

In addition, the results show that dummy variable of bank ownership (private ownership zero and state one) has positive effect and it means that state banks can increase financial instability. The results show that private banks have low financial instability. This is due to supervisory policies of private banks.

Then, we estimate the second model.

$$NPL_{i,t} = \beta_0 + \beta_1 NPL_{i,t-1} + \beta_2 CR3_t + \beta_3 CR3_t^2 + \beta_6 RInt_t + \beta_8 GDPG_t + \beta_4 ERR_t + \beta_5 CR_t + \beta_9 SIZE_{i,t} + \beta_{10} OS_{i,t} + \varepsilon_{i,t}$$

The results of F-Limer tests (to define using panel or pooled data) and Hausman) to show using fixed or random effects in panel data) for model (2) are presented in Table 6.

**Table 4**

### Results of F-Limer and Hausman test for model (2).

P-Value	Statistics value	Statistics	Test
<b>0.0000</b>	1.66567	<i>F</i>	<b>F limer</b>
<b>0.1367</b>	1.4768	$\chi^2$	<b>Hausman</b>

Based on the results of F-limer test and p-value (0.0000), H0 hypothesis is rejected at confidence interval 95% and it shows that we can use panel data method. Based on the results of Hausman test and p-value (0.0367) as above 0.05, H0 of test is rejected at confidence interval 95% and H1 hypothesis is supported. Thus, it is required that the model is

estimated by random effects method. Based on the results of F-Limer and Hausman and results of statistical assumption test of classic regression, model 2 of study is estimated by panel data and random effects. The results of model estimation are shown in Table 8.

**Table 5**

### Results of second hypothesis test by random effects method.

Effect	P-Value	T statistics	Coefficient	Variable	
Positive	0.0021	2.8592	0.6543	Intercept	Intercept
Positive	0.0039	2.7341	0.8634	Delayed payment	$NPL_{i,t-1}$

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Negative	0.0041	2.1341-	0.4321-	Concentration percent of three first banks	$CR3_t$
Negative	0.0001	6.0421-	1.0564-	Total shareholders above 5%	$Own$
Positive	0.0013	4.2514	2.0642	Interest rate	$RInt_t$
Negative	0.0001	6.1201-	1.5763-	GDP	$GDPG_t$
Positive	0.0011	5.1201	3.0864	Exchange rate risk	$ERR_t$
Positive	0.0041	2.6041	1.2854	Country risk	$CR_t$
Negative	0.0034	3.6509-	1.0346-	Bank size	$SIZE_{i,t}$
Positive	0.0052	2.0611	3.2976	Ownership dummy variable	$os_{i,t}$
0.454	Coefficient of determination				
1.9651 (0.0000)	<b>F statistics</b> (P-Value)				

Source. Study findings

The results show that concentration among three first banks and exclusion among banks has negative effect on financial stability of banks. In other words, the higher the competition among banks, this competition leads to reduced financial instability of banks.

Also, the results show that concentration among banks ownership and ownership exclusion of banks has negative effect on delayed payment. In other words, the higher the competition between banks ownership, this competition leads to increased financial instability of banks. The results show that the higher the exclusion of banks ownership in stock market, the total shareholders above 5% are higher and the lower financial instabilities and delayed payments in bank.

The results show that the effect of macro-economic factors including interest rate and growth of price index of goods and services as inflation index have positive and significant effect on instability financial index of banks and actual GDP has negative and significant effect on financial instability of banks. It means that by increasing interest and inflation rate, risk is imposed on production and bankruptcy of company is increased and delayed payment and financial instability are increased. However, the increase of production can reduce production risk and finally delayed payments are reduced and financial instability is reduced.

Results show that systematic risk factors including country risk and exchange rate risk have positive and significant effect on financial instability. This means that country risk is computed by international risk evaluation institutions as S&P, ECR, etc. and exchange rate risk is obtained by actual exchange rate changes and causes that production risk is increased and finally delayed payment and financial instability are increased.

The results show that specific feature of a bank includes bank size and has negative and significant effect on financial instability. These results show that increase of share of assets of each bank of total assets of bank system can lead to optimism of customers and reduced credit risk and financial instability of banks. In addition, the results show that dummy variable of bank ownership type (private ownership zero and state one) has positive effect and it means that state banks can increase financial instability. The results show that private banks have low financial instability. This is due to supervisory policies of private banks.

### 5- Results and recommendations

The results of study show that the higher the payment concentration of loan market and paid loans are on specific minority, the delayed bank payment and financial instability are increased. It is recommended that policies in loans payment are competitive not renting and clarity in this regard exists. Based on the results of study, concentration among the banks and exclusion among the banks

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have negative effect on financial stability of banks. It is recommended that to reduce financial instability of banks, it is recommended to reduce financial instability of banks and increase competition among banks and central bank to reduce exclusion can make efforts. Based on the results of study showing that concentration among the banks ownership and ownership exclusion among the banks have negative effect on delayed payment and it is recommended to reduce financial instability and consider percent of shareholders above 5%. Based on the results, we can say the effect of macro-economic factors including interest rate and growth of price of goods and services as inflation index have positive and significant effect on financial instability of banks, it is recommended that macro-economic policies are used to reduce interest rate and inflation to reduce

financial instability of banks. Based on the results of study in which actual GDP has negative and significant effect on financial instability of banks, economic-growth based policies are recommended. The results show that systematic risk factors including country risk and exchange rate risk have positive and significant effect on financial instability, it is proposed to use exchange policies to reduce volatilities to reduce financial instability. The results show that special feature of bank including bank size has negative and significant effect on financial instability. It is recommended that bank management policies are used to increase bank assets. The results show that dummy variable of bank ownership type (private ownership zero and state one) have positive effect and it is proposed that banking system of country moves to privatization.

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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Rezvan Torabi**

Assistance Professor in Islamic Azad University,  
Dehaghan Branch, Department of finance,  
Esfahan, Iran  
[torabi.economic@gmail.com](mailto:torabi.economic@gmail.com)

**Mehrdad Farshid**

Master of finance in Islamic Azad University,  
Dehaghan Branch, Department of finance,  
Esfahan, Iran

**SECTION 31. Economic research, finance,  
innovation, risk management.**

## THE EFFECT OF CORPORATE GOVERNANCE AND AUDIT EXPERT ON PREDICTION ACCURACY OF SHARES RETURN IN SELECTED INDUSTRY IN TEHRAN STOCK EXCHANGE

**Abstract:** *The important role of financial accounting and corporate governance is to help financial users about forming their expectations related to companies' future interest. Previous studies have shown financial accountant experts in audit committee have relationship with high quality of financial reporting in companies. The aim of this research is to study the effect of corporate governance and professional auditor on accuracy of predicting the shares return in selected industries listed in Tehran Stock Exchange during 2006 to 2013. The results of research show that corporate governance indexes on the amount of first estimation remains as accuracy of predicting shares return variable as dependent variable in second pattern is significant and it indicates that the effect of the percent of biggest ownership on dependent variable of predicting shares return error is negative and significant, it is recommended that to reduce predicting shares return error and as a result increasing the accuracy of predicting shares return, financial managements of Tehran Stock Exchange companies must apply policies based on increasing the percent of biggest shares ownership. The effect of corporate governance variable on dependent variable of error of predicting shares return is negative and significant and it is recommended to reduce error of predicting shares return and as a result increasing the accuracy of predicting shares return, financial managements of Tehran Stock Exchange companies should apply based on increasing the percent of shares governance ownership.*

**Key words:** corporate governance, expert auditor, predicting shares return.

**Language:** English

**Citation:** Torabi R, Farshid M (2016) THE EFFECT OF CORPORATE GOVERNANCE AND AUDIT EXPERT ON PREDICTION ACCURACY OF SHARES RETURN IN SELECTED INDUSTRY IN TEHRAN STOCK EXCHANGE. ISJ Theoretical & Applied Science, 01 (33): 11-17.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-3> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.3>

### 1- Introduction

Discussion of corporate governance is great importance after the recent financial crisis. The role of corporate governance is important for several reasons. First of all, the establishment of corporate governance causes to use scarce resources in economic efficiently. Secondly, resources allocate toward efficient investments. Thirdly, corporate governance helps management to concentrate on improving firms' performance. Fourthly, corporate governance helps managing director or the board of management to select best tool to control scarce resources. Fifthly, corporate governance forces institutions to accept rules.

Based on this theory, delegation relationship is the contract between shareholders and the management of financial institution. Based on

delegation theory, the board of directors ignores the management of shareholders for controlling the management of the firms. Therefore, the board of directors shows reaction directly to control company appropriately. Therefore, bad selection and moral hazard might be happened due to separating management from ownership and the board of management might maximize their interests against shareholders interests. Therefore, the mechanism should be applied to consider the shareholders' interests. Making suitable corporate governance can remove interest differences.

The role of auditing in accreditation to the information of companies' interest about renewing presenting recent company's interest and big companies' bankruptcy is important considerably. The differences caused by auditing quality show





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themselves as the difference in presented validity by auditors and interest quality of their clients. Since auditing quality has different criteria and it is invisible inherently, there is no any especial auditing which is considered as the index for it. Most of previous researches use auditor's reputation as the index for auditing quality and have studied the relationship between reputation and interest quality. In addition, other researchers in addition to reputation express their assumption in a way that auditor industry specialization help the presented validity by auditor directly and the evidences indicate that especial auditor of industry presents more effectiveness auditing and structural changes in auditing companies toward accessing to industry specialization indicate that industry specialization plays important role in auditing quality.

The purpose of this research is to study the effect of corporate governance and professional auditor on the accuracy of predicting shares return in selected industries listed in Tehran Stock Exchange during the period of 2006 to 2013.

### 2- Theoretical framework

#### 2-1- Corporate governance

For many years in the past, economists assume that all groups related to one shares company work for one common goal. However, in past thirty years many cases from conflicts of interest between groups and the way companies face to these conflicts have posed by economists. These issues are posed generally under the title of delegation theory in accounting. The relationship of delegation is contract which owner of work or owner selects agent by itself and concedes decision-making to them. In delegation relationships, the aim of owner is maximizing wealth and therefore, to access to this goal, they control the agents' work and they evaluate their performance.

Managements' activities are limited or guided by some factors. These factors should be posed for more suitable corporate governance and companies consider rules and requirements in doing their duties and different institutions monitor on the benefit of activities of economic units. These factors contain many cases such as: board of management (The right to hire and fire and reward their managers), rules, worker agreements, market and even competition environment. Generally, the factors in above can be considered in two forms of external control mechanisms (like market) and internal control mechanisms (like board of management) (Karami, 2008).

One of the effective external control mechanisms on corporate governance which is very important is the emergence of institutional investors as the owner of capital. Based on Boosch definition

(1998), institutional investors are big investors like banks, insurance companies, investment companies and etc. he expressed that institutional investors concede companies through collecting information and pricing management decisions implicitly and through controlling the way of companies' acts correctly. In better words, institutional investors have resources to influence and control management and also whether institutional investors use their power to control or not, are the function of the amount of their ownerships (Chang and Kim, 2002).

#### 2-2- Auditing quality

Although the auditor responsibilities in auditing quality are accepted as one of the auditing behavioral assumptions (Hasas Yegane, 2005), however, far less comprehensive and clear definition of audit quality that is acceptable to everyone has done. Perhaps, this situation can be justified with regard to the issue that auditors responsibilities in each period of time is describable in the form of public expectations, and also with regard to the issue that auditing quality is a concept which cannot observe directly (Lin et al, 2009).

#### 2-3- Auditor expertise in the industry

Auditors can create a kind of difference between themselves and other auditors due to the reason that they are looking forward to obtain expertise in handling active companies in the industry. The existence of this differentiation gives possibility to auditors to have two options of less price and high services quality (better disclosure quality) simultaneously instead of having one attractive option (less price for auditing) to attract the shareholders of public societies (Kimberly et al, 2004: 39).

#### 2-4- Research background

Abernati et al (2013) in an article entitled "the committee of financial auditing specialization and the characteristics of predicting interest by analyzers" have been dealt with to study this issue. The main findings of this study show that there is significant relationship between financial accounting specializations in auditing committee and predicting interest which is done by analyzers. In contrast, there is no any significant relationship between non-financial accounting specializations (like controlling specializations) and the accuracy of prediction which is done by analyzers. these findings has dealt with better understanding the relationship between these two cases through determining the advantages of entering financial specializations in auditing committee.

Almensir et al (2012) in an article entitled "the effect of corporate governance on the performance of banks of Jordan" have studied this issue. The indexes

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of the board of management size, the combination of the board of management and external ownership consider as corporate governance indexes. The obtained results indicate that there is positive relationship between corporate governance indexes those mean the number of the board of management members and external ownership and the performance of banking system of Jordan. The board of management size and separating ownership from management has negative relationship with the performance of banking system of this country.

Peni et al (2012) in their article examined the effect of corporate governance of banks on giving credit to deposit sector and the amount of doubtful receivable during the period of financial crisis. The results indicate that banks those have stronger corporate governance mechanisms to compare with other banks, their profitability indexes are also higher. Also, the effect of corporate governance on giving credits in deposit sector has been complex and it depends on the definition of crisis period. Although, banks those have stronger corporate governance to compare with others experience less amount of doubtful receivable. Banks with weaker corporate governance after the issue that deposit market reach to crisis, they reduce the deposit loans those are in danger.

Tie (2011) has studied the effect of corporate governance on profitability of banks by theory agency and the statistics of 15 banks in the country of Malaysia. The indexes of return asset and shares return are considered as the indexes of profitability of banks. The estimated results indicate that independency of the board of directors and the kind of bank ownership has negative relationship with shares return.

Karjalinen (2011) found that expertise in auditing partner industry in Finland has positive relationship with the quality of reported interest. He observed that the level of discretionary accruals in companies those are auditing by expertise partner is less than private companies. Therefore, the results indicate this claim that the expertise of auditing partner industry of one resource considers as differentiate in auditing quality.

### 3- Research pattern

Based on research and theoretical literature, the econometric model in below is used in this research:

Dependent variable: DASP

The accuracy of predicting shares return which is obtained by the difference of real amount and the

amount of shares return estimation (the amount of estimation remains)

$$Y = \alpha_0 + \alpha_1 \text{Coverge} + \alpha_2 \text{So} + \alpha_3 \text{Size} + \alpha_4 \text{EL} \\ + \alpha_5 \text{ROA} + \alpha_6 \text{DPS} + \alpha_7 \text{Loss} \\ + \alpha_8 \text{industries dummies} \\ + \alpha_9 \text{year} + \varepsilon$$

In first equation, Y is the variable of shares return of the company.

Then, with the use of extracting the amount of estimation remains as the variable of accuracy of predicting shares return, this variable is used in the second pattern as dependent variable and the pattern in below is estimated:

$$\text{DASP} = \alpha_0 + \alpha_1 \text{Coverge} + \alpha_2 \text{So} + \alpha_3 \text{Size} + \alpha_4 \text{EL} \\ + \alpha_5 \text{ROA} + \alpha_6 \text{DPS} + \alpha_7 \text{Loss} \\ + \alpha_8 \text{industries dummies} \\ + \alpha_9 \text{year} + \varepsilon$$

Independent variable:

The indexes of corporate governance: the total member of the board of management, the number of non-responsibilities, dual responsibilities of CEO.

Specialist virtual variable auditor so: according to the issue that the expertise of auditor in different companies is different, in this research the virtual variable of zero and 1 to exist the expert, there are varieties of auditors depend on kind of expertise contain: financial accounting, financial non-accounting and non-financial in auditing committee.

Control variables:

Company size (asset logarithm) Size, the ratio of debt to total asset EL, profitability index ROA, the index of interest of each share DPS, the index of company loss.

### 4- Model estimation

Based on the results of F Limer test and Hasman test, the model of research is estimated based on panel data method by fix effects. The amount of F regression which shows the power of model explanation is less than 0/01 for this statistical probability and it can be said that it is significant in confidence level of 99 percent and it is authentic. Also, observing the amount of Durbin-Watson statistic (1/84) is also confirmed the issue that there is no any disruption autocorrelation between components, because this amount is between 1/5 and 2/5.

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**Table 1**

**The results related to estimating the fix effects of research model (dependent variable: DASP (the error of predicting shares return)).**

p_Value	Statistic t	The error of standard	Estimate coefficient	Variable symbol	The name of variable
0.0001	4.071384	4.010627	16.32880	C	Intercept
0.0612	1.880734	0.047652	0.089621	X1	Indexes of corporate governance (total member of the board of managements)
0.0909	2.311641	0.031313	0.041072	X2	Indexes of corporate governance (number of non-responsibilities)
0.0141	2.471893	0.082968	0.205087	X3	Indexes of corporate governance (dual responsibilities of CEO)
0.0200	-2.342829	0.116207	-0.272253	X4	Virtual variable of specialist auditor (audit quality)
0.0242	-2.637786	0.473766	-0.302161	X5	The ratio of debt to total asset(financial leverage)
0.0117	-2.539469	0.474749	-1.205611	X6	Profitability index (ROA)
0.0000	-4.395791	0.617962	-2.716432	X7	Company size(asset logarithm)
0.0195	2.228486	0.357389	0.181658	X8	Company loss index (Loss)
0.0000	-6.633814	0.375717	-2.492437	X10	The index of the interest of each share DPS (working capital/ assets)
0.569532	Determine coefficient	0.000000	Significance of F statistic		4.506050 :F statistics
0.357615	Adjusted determine coefficient	305	The number of observations	1.846655	Durbin-Watson test

The results of model show that the effect of indexes of corporate governance on dependent variable of DASP (the error of predicting shares return) is significant and it indicates that the effect of total member of the board of management variable on dependent variable of DASP (the error of predicting shares return) in amount of 0/089621 is positive and significant and also the effect of corporate governance variable (the number of non-responsibilities) on dependent variable of DASP (the error of predicting shares return) in amount of 0/041072 is positive and in the level of 10 percent is significant. The effect of corporate governance indexes variable (dual responsibilities of the board of management) on dependent variable of DASP in amount of 0/205087 is positive and in the level of 10 percent is significant. This shows that increasing the number of management in the board of directors creates kind of information asymmetric for shares that in light of this lack of transparency and a possible bribery, the risk and fluctuation of the company will be increased and the error of predicting shares return will be increased and consequently, the accuracy of predicting shares return will be reduced.

The results of research also indicate that the effect virtual independent variable specialist auditor on dependent variable of DASP in amount of 0/272253 is negative and significant and it shows

that with the existence of varieties of auditors depends on kind of specialist contains financial accounting, financial non-accounting and non-financial in auditing committee, the probability of lack of information asymmetric for shares will be decreased that in the light of increasing auditing quality and transparency, risk and fluctuation of company will be reduced and the error of predicting shares return will be reduced and consequently, the accuracy predicting shares return will be increased.

The results of research also indicate that the effect of controlling variable of company size (assets logarithm) on dependent variable of DASP (the error of predicting shares return) in amount of 2/716432 is negative and significant and it shows with the existence of increasing company's assets, size and credit of the company will be increased that in the light of increasing this credit, risk and fluctuation of company is decreased and the error of predicting shares return is decreased and consequently, the accuracy of predicting shares return will be increased.

The results of research also indicate that the effect of controlling variable of the ration of debt to total asset (financial leverage) on dependent variable of DASP (the error of predicting shares return) in amount of 0/302161 is negative and significant and it

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shows that with the existence of financial leverages of company, risk of bankruptcy of the company will be increased that in the light of increasing this, risk and fluctuation of company is increased and the error of predicting shares return is increased and consequently, the accuracy of predicting shares return will be decreased.

The results of research also indicate that the effect of controlling variable of profitability index ROA on dependent variable of DASP (the error of predicting shares return) in amount of 1/205611 is negative and significant and it shows that with the existence of increasing profitability index ROA, size and credit and persuading shareholders to company will be increased that in the light of increasing this credit, risk and fluctuation of the company will be decreased and the error of predicting shares return will be decreased and consequently, the accuracy of predicting shares return will be increased.

The results of research indicate that the effect of controlling variable of index of interest of each share DPS on dependent variable of DASP in amount of 2/492437 is negative and significant and it shows that with the existence of increasing the index of interest of each share DPS, size and credit and persuading shareholders to company will be increased that in the light of increasing this credit, risk and fluctuation of the company will be decreased and the error of predicting shares return will be decreased and consequently, the accuracy of predicting shares return will be increased.

The results also indicate that the effect of controlling variable of company loss index on dependent variable of DASP in amount of 0/181658 is positive and significant and it shows that with the existence of increasing company loss index, credit and persuading shareholders to company will be decreased that in the light of reducing this credit, risk and fluctuation of the company will be increased and the error of predicting shares return will be increased and consequently, the accuracy of predicting shares return will be decreased.

### 5- Conclusion and Recommendations

- According to the results, second model of research shows that the effect of corporate governance indexes Coverge on amount of remains of first estimation as the accuracy of predicting shares return variable as dependent variable in second pattern are significant and it indicates that the effect of the percent of biggest ownership on dependent variable of the error of predicting shares return is negative and significant, it is recommended that to reduce the error of predicting shares return and consequently, increasing the accuracy of

predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policy based on increasing the percentage of biggest shares ownership.

- Also according to the results of research which show the effect of the government ownership percentage variable on dependent variable of the error of predicting shares return is negative and significant and it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on increasing governmental shares ownership percentage.
- Also according to the results of research which show the effect of independent variable of institutional ownership percentage on dependent variable of the error of predicting shares return is negative and significant, it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on increasing the shares institutional ownership percentage.
- Also according to the results of research which show the effect of independent variable of managers ownership percentage on dependent variable of the error of predicting shares return is positive and significant, it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on reducing the shares managers ownership percentage.
- Also according to the results of research which show the effect of independent variable of the number of managers in the board of directors on dependent variable of the error of predicting shares return is positive and significant, it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on reducing the number of managers in the board of directors.
- Also according to the results of research indicate that the effect of independent variable of virtual variable of specialist auditor on dependent variable of the error of predicting shares return is negative and significant, it is recommended to reduce the error of predicting



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shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on increasing the number of shares specialist auditor.

- Also according to the results of research which show the effect of controlling variable of company size (asset logarithm) on dependent variable of the error of predicting shares return is negative and significant, it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on increasing shares company size (asset logarithm).
- Also according to the results of research which show the effect controlling variable of the ratio of debt to total asset EL on dependent variable of the error of predicting shares return is negative and significant, it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on reducing shares the ratio of debt to total asset.
- Also according to the results of research which show the effect of controlling variable of profitability index ROA on dependent variable

of the error of predicting shares return is negative and significant, it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on increasing the shares profitability index.

- Also according to the results of research which show the effect of controlling variable of interest index of each share DPS on dependent variable of the error of predicting shares return is negative and significant, it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on increasing the shares interest index of each share.
- Also according to the results of research which show the effect of controlling variable of company loss index on dependent variable of the error of predicting shares return is positive and significant, it is recommended to reduce the error of predicting shares return and consequently, increasing the accuracy of predicting shares return, the financial managements of companies listed in Tehran Stock Exchange apply policies based on reducing the shares company loss index.

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<b>JIF</b>	<b>= 1.500</b>	<b>SJIF (Morocco)</b>	<b>= 2.031</b>		

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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Rezvan Torabi**

Assistance Professor in Islamic Azad University,  
Dehaghan Branch, Department of finance,  
Esfahan, Iran  
[torabi.economic@gmail.com](mailto:torabi.economic@gmail.com)

**Fahimeh Ganji**

Master of finance in Islamic Azad University,  
Dehaghan Branch, Department of finance,  
Esfahan, Iran

**SECTION 31. Economic research, finance,  
innovation, risk management.**

## A SURVEY OF THE RELATIONSHIP BETWEEN AGENCY COSTS AND FINANCIAL RATIOS IN COMPANIES LISTED ON TSE DURING 2008- 2012

**Abstract:** Economic growth, increased number of closely held companies and separation of management from ownership have challenged agency issues as one of the most important concerns of investors. Agency issues are based on the reality that investors have no required capability to manage the company affairs. Thus, this responsibility is delegated to managers. If managers and investors maximize their personal benefits and controlling the performance of agent requires costs. This shows that the agent attempts not to fulfill the benefits of owner and maximize his wealth. Additionally, selection of a good criterion to be sure of achieving final goal as maximizing the wealth of owners is one of the most important solutions of shareholders to evaluate the company performance and correct economic decisions. The present study evaluates the relationship between agency cost and financial ratios in companies listed on TSE. The agency relationship is a type of contract by which the owner delegates an agent to perform operation and delegate's power to take decision. By formation of agency relationship, agency costs of benefits conflict are created between parties. To measure financial ratios via profitability ratios, six criteria of ROA-ROS-ROE-NPM-ROC-GPM are applied. To do this, the information of companies listed on TSE during 2008-2012 is used. The general results of study show that there is a significant association between agency costs, financial ratios, return on asset, return on sale, net profit margin, return on capital and gross profit margin and all hypotheses are supported.

**Key words:** Agency theory, Financial ratios, Agency costs, Benefits conflict, Profitability ratios, Stock exchange market.

**Language:** English

**Citation:** Torabi R, Ganji F (2016) A SURVEY OF THE RELATIONSHIP BETWEEN AGENCY COSTS AND FINANCIAL RATIOS IN COMPANIES LISTED ON TSE DURING 2008-2012. ISJ Theoretical & Applied Science, 01 (33): 18-21.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-4> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.4>

### 1- Introduction

Agency problem is encouraging the agent to take decisions to maximize the welfare of owner (owners). By formation of agency relationship, by benefits conflict between two parties, agency cost is increased. The managers of companies are agents of shareholders. This relationship is full of contradictory benefits. Agency theory as the analyzer of these conflicts is an important part of economic and financial literature. One of the tools to determine the financial situation of companies is analysis of financial ratios. Indeed, financial ratios reveal important realities regarding the financial condition and operation of a company. The ratios evaluate the relationship between some variables and this evaluation provides an attitude to different aspects of

business units as profitability, liquidity, capacity adequacy, quality of asset and management risk. Determination of required ratios depends upon the purpose of analysis (e.g. profitability, liquidity, etc.). Due to easy calculation and easy understanding, proportional evaluation has wide application. The analysis of financial statements is started with using financial ratios based on balance sheet data, profit and loss statement and cash flow statement. Financial ratios show the power or weakness of companies compared to other companies of the same industry, pioneer companies of the past year performance of the same company. The main problem of study is the evaluation of the relationship between agency costs and financial ratios in the companies listed on TSE. It is attempted to answer this question whether there



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is a significant relationship between agency costs with financial ratios in companies listed on TSE or not. If it is, this relationship can be changed.

### 2- Review of Literature

Noravesh and Ebrahimi Kordlar (2011) in a study evaluated the role of institutional investment in reduction of liquidity in TSE. The findings of study showed that in companies with high institutional degree compared to low institutional ownership, the future profit information is reflected mostly in stock price.

Mojtahedzade (2011) evaluates the relationship between ownership as an independent variable and agency costs, independent audit costs and managers fee as dependent variable. The results of study showed that there was no relationship between management ownership and agency costs, independent audit cost and managers fee.

Mehdi and Monfared (2011) in a study evaluated the effect of board composition on agency costs from executive theory and found that the executive members of board had no significant effect on agency costs.

Lontis et al., (2011) considered audit cost of companies as agency cost and evaluated the relationship between product market competition and agency costs in Greece. They found that audit hours and audit cost had inverse and significant association with product market competitiveness.

Wang (2010) performed empirical test of the relationship between free cash flow and agency cost and then evaluated the effect of both of them on

performance of Taiwan companies. Considering total asset turnover and operating expense ratio as sufficient agency cost measures, the study found evidence to support the agency theory, meaning AC had a significantly negative impact on firm performance and stock return. In contrast, the study found a significantly positive relation between free cash flow and firm performance measures, indicating lack of evidence supporting the free cash flow hypothesis.

### 3- Study variables

#### Financial ratios

There are various classifications of financial ratios, a general division as applied more than other classifications is the classification of financial ratios in five groups as:

- 1- Liquidity ratios
- 2- Return ratios
- 3- Performance ratios
- 4- Profitability ratios
- 5- Market ratios

Based on the number of extracted financial ratios of financial reports, we should consider the internal correlation and overlapping between financial ratios. The ratios with the lowest internal correlation should be in a group to apply them as descriptive variables of an event.

In each classification, by factor analysis, financial ratios are selected and besides the relevant changes with return on stock rate have the lowest internal correlation with each other. The selected ratios in the study are mentioned in the following Table.

**Table 1**

#### Applied financial ratios.

Ratio type	Classification
Current ratio	Liquidity ratios
Quick ratio	
GPM	Profitability ratios
Sale to profit	
Inventory turnover	Performance ratios
Fixed assets turnover	
ROA	Return ratios
Worth return on asset	
Earnings per share	Market ratios
Price to income	

### 4- Analysis results

The findings of main hypothesis test show that there is a significant association between agency costs and financial ratios.

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Table 2

### Statistics data.

DW statistics	Statistics F	$\bar{R}^2$	P-value	T statistics	Standard error	Coefficient	Independent variable	Dependent variable	Hypothesis
1.7	1227	0.99	0.00	636.49	0.00	0.579	C	Log $r_t$	1
			0.00	58.354	0.01	0.743	Log $(a_{t-1})^2$		
			0.00	23.883-	0.013	0.313-	Log $(b_{t-1})^2$		
1.551	157.7	0.34	0.00	10.248	0.122	1.254	Log $d_{t-1}$	Log $r_t$	2
			0.00	19.152	0.233	4.465	Log $e_{t-1}$		
1.894	28.08	0.15	0.00	5.9874	0.249	1.496	C	Log $r_t$	3
			0.00	4.0898	0.050	0.205	Log $(f_{t-1})^2$		
			0.00	7.0780-	0.277	1.966-	Log $(J_{t-1})^2$		
1.632	1974	0.93	0.00	95.721-	0.000	0.065-	Log $h_{t-1}$	Log $r_t$	4
			0.00	565.15	0.000	0.299	Log $k_{t-1}$		
1.457	3784	0.95	0.00	11.052	0.000	0.003	Log $p_{t-1}$	Log $r_t$	5
			0.00	16.099	0.000	0.0001	Log $s_{t-1}$		
1.522	2893	95./	0.00	95.721-	0.000	0.065-	Log $h_{t-1}$	Log $r_t$	6
			0.00	565.15	0.000	0.299	Log $k_{t-1}$		
1.362	1435	0.95	0.00	11.052	0.000	0.003	Log $p_{t-1}$	Log $r_t$	7
			0.00	16.099	0.000	0.0001	Log $s_{t-1}$		

As shown in the Table, P-value in all hypotheses is 0.000 and the statistics in third hypothesis is more than other hypotheses.

The results show that there is a linear significant association between agency costs and return on asset of company with their ratios. Also, the results show that there is a linear significant association between return on sale of company in studied companies with their agency cost.

The results show that there is a linear significant association between return on equity in studied companies with their residual earnings and there is a linear significant association between net profit return with agency cost in studied companies. Also, there is a linear significant association between agency costs and gross profit of company in studied companies. The results show that there is a linear

significant association between sale return of company in the studied companies with their agency cost.

### 5- Conclusion and Recommendation

As shown in the results of study hypotheses, there are various factors affecting agency costs and if they are identified well by organizations can be used and can improve operation of company and by reduction of agency costs, benefits of two groups are consistent and there is a little benefits conflict and by reduction of company costs, shareholders can achieve maximum benefits and wealth. Managers are inclined to company growth more than its optimal amount as the company growth leads to the increase of benefits under the control of managers, increase of power and reward. Based on the results of study, the following recommendations are presented:



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- 1- Based on the results of study, it is recommended that the companies consider return on sale of companies mostly. To reduce agency cost due to its inverse relationship with return on sale, its sale is increased.
- 2- To evaluate the relation of financial ratios and agency costs, capital pricing model (CAPM) is applied and the results are compared with data combination model.
- 3- We can use neural network model and logit regression technique to predict return on stock. For results reliability, the study is conducted in long period as 10 years. The number of financial ratios is increased or other relevant ratios are applied.

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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Alexei Grigoryevich Burda**

PhD, Head of the Department of Economic  
Cybernetics of the Kuban State Agrarian University,  
Krasnodar, Russian Federation  
[agburda@mail.ru](mailto:agburda@mail.ru)

**SECTION 21. Pedagogy. Psychology. Innovation in  
Education.**

## INNOVATIONS IN TRAINING OF THE TOP SKILLS: INFORMATION SUPPORT OF TEACHING BASES OF RESEARCH ACTIVITY TO GRADUATE STUDENTS-ECONOMISTS

**Abstract:** In article innovative approaches to teaching discipline «Basics of research activity» to the graduate students who are trained in the Economy direction when training the top skills in postgraduate study are covered features of carrying out lecture occupations and occupations of seminar type, the organization of independent work according to new requirements are reflected.

**Key words:** innovation, innovative approach, scientific activities, research, postgraduate, personnel, higher qualifications, the economy, the educational process, scientometrics, information support.

**Language:** English

**Citation:** Burda AG (2016) INNOVATIONS IN TRAINING OF THE TOP SKILLS: INFORMATION SUPPORT OF TEACHING BASES OF RESEARCH ACTIVITY TO GRADUATE STUDENTS-ECONOMISTS. ISJ Theoretical & Applied Science, 01 (33): 22-25.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-5> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.5>

The relevance of generalization of experience of the educational process in graduate school due to the fact that the training of highly qualified personnel by the Federal Law "On Education in the Russian Federation" is considered as the level of higher education that advances the development and implementation of training programs of the teaching staff in graduate school in the list of priorities higher education and the formation of an innovative society [3].

The purpose of the study - summarize the experience of the application of innovative approaches and perspectives of information support of teaching the basics of research activities in the preparation of highly qualified personnel in graduate school in the development of information and the formation of an innovative society.

In the Kuban State Agrarian University Department of Economic Cybernetics teaches discipline "Fundamentals of research activities" graduate students on seven areas of training. The article used the monographic method of describing the training of highly qualified personnel in the direction of "Economy", which focused the largest contingent of graduate students, six profiles (direction) in the framework of ongoing educational programs: "Economics and National Economy Management", "Accounting and Statistics", "Finance

and Credit", "The world economy", "Economic Theory", "Mathematical and instrumental methods of economics". In accordance with the competencies defined by the educational standards and curricula for each profile (orientation) developed work programs of discipline "Fundamentals of research activities" and the foundations of assessment tools.

The necessity and appropriateness of teaching the basics of research and development economists in graduate obvious and caused by such professional activities, certain educational standard as research activities in the field of economics and teaching activities: conducting scientific research in the educational organization.

Topics of lectures include such important moments as the young researchers:

the value and nature of scientific research, scientific research;

development of scientific research in Russia and abroad, including the development of science in different countries, methodological basis for determining the level of science in different countries, the existing indices and ratings in this area (rating countries in terms of research activity index level of education in the countries world adult literacy index, index of aggregate share of students in primary, secondary and higher education, rating the



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best universities in the world ranking of universities in Russia, including the level of research activity);

the organization of science in the Russian Federation, the statistics of the number of organizations engaged in research and development, the number of researchers, the age distribution of researchers in the domestic science in different years; Main indicators of postgraduate study: the number of organizations that train graduate students the number of graduate students, admission to graduate school, graduation from graduate school, including the defense of a thesis, the number of graduate students in the subject of the Russian Federation and in separate branches of science;

methodology and methods of scientific research, including consideration of the nature of the research methodology, the principles and problems of research, development of hypotheses and concept studies, procedural and methodological schemes and scientific knowledge in the research;

basic methods of finding information for scientific research, including consideration of the documentary sources of information, organization of reference and information activities, methods of work with directories and files, including electronic catalogs of libraries, resources and services Scientific Electronic Library, the Russian State Library, electronic library systems;

methods of working on the manuscript of scientific research, particularly the preparation and presentation of the dissertation, including the composition of scientific works, receptions scientific writing, the manuscript, the language and style of scientific work, the consideration of the history of development of the dissertation as a qualifying research, procedures for the preparation, presentation and defense of a thesis.

Prepared lecture notes, methodological developments for training and seminary-type benefits for independent work of students placed on the cathedral site in the village of "Documents" section on the educational portal of the University (<http://edu.kubsau.local>). Multimedia presentations of lectures delivered in 2015-2016 academic year, and will be located on the educational portal. The organization of educational process on the basis of scientific-research activities are widely used information technology and is available at the Department of Economic Cybernetics, Kuban State Agrarian University experience of their use in research [1], [11] and education [2], [9], [10].

Classes such as seminary graduate students are invited in relation to the subject of his research, his final qualifying works, which tend to be based future PhD thesis, to justify the urgency, aim to formulate and define the research problem, its subject and object, to formulate a working hypothesis. In recognition of the students, the implementation of this task is useful not only for understanding the key

points of the methodological apparatus of scientific research, but also of practical interest in preparing for the future introduction of the final qualifying work and the introductory part of the report to protect it.

Carrying out a literature search on the subject of his scientific work using materials Scientific Electronic Library (<http://e.library.ru>), the national digital resource Rukont - interdisciplinary digital library (<http://rucont.ru>), electronic library system IPR books (<http://www.iprbookshop.ru>), e-library system of the publishing house "Lan» (<http://lanbook.com/ebs>), the Russian State Library (<http://rsb.ru>), electronic catalog of scientific and technical literature Russian Institute for Scientific and Technical Information of Russian Academy of Sciences, the educational portal KubSAU (<http://edu.kubsau.local>), electronic library catalog KubGAU, students make a list of bibliographic records found literature indicating the availability of the source.

Studying the list of remote network resources of the Russian State Library ([www.rsb.ru/ru/networkresource](http://www.rsb.ru/ru/networkresource)) is accompanied by definition, those that may be useful during a specific individual research. Of particular interest to graduate students is a network share of the Russian State Library "Theses: foreign collection in the public domain» ([www.rsb.ru/ru/root34893492/diss](http://www.rsb.ru/ru/root34893492/diss)). Using one of the presented projects, for example, DART-Europe, students are trying to find the thesis of foreign scholars on the subject close to his research. In this interdisciplinary relationship of a foreign language graduate students learn in practice, and when there are difficulties with the translation services use the Internet for online-translation. Foreign Language thus acts as a source of social and cultural formation of the individual graduate students and expand the horizons of students [6].

By studying the procedure for depositing theses (projects) prepared for the defense of dissertations and theses, as well as results of intellectual activities (unpublished works) in the Russian State Library, students are asked to answer the questions: "What are the goals deposition of different types of work? In what ways can use to provide the author of the work and a set of documents to the Russian State Library? Is there a fee for this service? What document is issued and what is the cost Escrow unpublished works by the Russian State Library? "

In the study of discipline students learn the formulation of the problem of measurement of quantitative characteristics of scientific information, history and main directions of scientometrics, framework for the assessment and funding of various research units (institutes, teams, individuals), the problem of the use of scientometric assessments, citation index, Hirsch, online projects Web of Science, Scopus, Web of Knowledge, Russian Science Citation Index. Using materials

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<http://elibrary.ru>, graduate define index Hirsch said the teacher research organizations and universities in Krasnodar, carried out a comparative analysis of the publication activity of universities, colleges build rating of Krasnodar region in the number of foreign publications, the number of publications in international journals and of the Russian WAC list, according to the number of authors who have published in journals included in Web of Science or Scopus, define index Hirsch said the teacher of the author, shall seek a list of articles that refer to the work of the author of this teacher, the percentage of self-citations. In carrying out these tasks take into account the experience of the analysis of the scientific activity of university professors in some regions [7] conceptualized views of reputable scientists about the negative consequences of ill-considered active implementation of scientometric approaches [5], approaches reputable scientists and experts in the organization of information support systems in various fields, including education [4], [8], [9].

Education graduate economists on the subject "Fundamentals of research activities" carried out by full-time and correspondence. Postgraduates Absentee Carry out work on individual options. Tasks for quiz issued for orientation sessions are posted on the Internet at the cathedral page and include theoretical questions on the methodology of research and practical tasks for the development of methods and procedures to find information for research using electronic library systems and directories, definition of publication activity of scientific organizations and scientists, the use of

modern Internet services to participate in scientific conferences, publication of articles in journals, including the application procedure, sending a text article, acquaintance with published materials and preparation of bibliographic description.

Since the design of articles, pamphlets and monographs scientist has to comply with the requirements of magazines and publishers to comply with the level of originality of scientific texts, post-graduate students with a special interest related to practical tasks in this field, and the discussion of the results has been very lively and emotionally.

At the final session in the mode of active communication business professional interactively train and master teacher, including communication via a computer network in real time, investigated the main challenges and trends research. Summarizing the progress made in the course of development of the discipline of the main results of the classroom and the resulting individual, independent and research work of students on the basic provisions of the foundations of scientific research.

It seems promising graduate students to familiarize with the possibilities of bibliographic managers, as well as automated work with the bibliography in modern text editors

The accumulated experience of innovative approaches to the organization and implementation of educational process on discipline "Fundamentals of research activities" in the postgraduate of the Kuban State Agrarian University in the direction of "Economy", in our opinion, may be interesting and useful to our colleagues in educational institutions offering training higher qualification.

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SOI: [1.1/TAS](http://s-o-i.org/1.1/TAS) DOI: [10.15863/TAS](https://doi.org/10.15863/TAS)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Zainab W. Abdul Lateef**

Department of Physiology, Medical Physics, College of  
Medicine, Al-Mustansiriya University, Baghdad, Iraq  
[zainabqush@yahoo.com](mailto:zainabqush@yahoo.com)

**Khalid A. Ahmed**

Department of physics, College of Science,  
Al-Mustansiriya University, Baghdad, Iraq

**Mohammed F. Al Marjani**

Department of Biology, College of Science,  
Al-Mustansiriya University, Baghdad, Iraq

SECTION 3. Nanotechnology. Physics.

## WAKE EFFECTS INDUCED IN LIQUID WATER BY HYDROGEN- DICLUSTER IONS

**Abstract:** A theoretical model has been established to simulate the penetration process of hydrogen dicluster ions targeting liquid water at five incident energies [0.05, 0.25, 0.1, 0.2 and 2.5] MeV. This study is a novel approach in management the induced spatial potential related to the stochastic nature of energy loss in matter of single and correlated proton of hydrogen-dicluster beam radiation on H<sub>2</sub>O, aiming to explore the effects of the induced wake potential by hydrogen dicluster ions on the liquid water, H<sub>2</sub>O. This study was conducted in department of physics/ college of science, Al-Mustansiriya University in Iraq. The induced spatial potential by the incident diclusters is described by the dielectric response formalism, in which the Drude dielectric function and plasmon-pole approximation, PPA are adopted to provide a detailed evaluation to the studied wake potential [1, 2]. Calculations have been done for each elements of H<sub>2</sub>O, then apply Bragg's rule [3]. In the case of single-proton of hydrogen dicluster ions (denoted as uncorrelated ions), the wake potential is nearly independent of incident energy of H<sub>2</sub><sup>+</sup>-dicluster ions. It is found that the dynamical interaction potential between dicluster ions leads to a spatial asymmetry to the cluster structure.

**Key words:** Wake potential, Hydrogen-dicluster ion, liquid water.

**Language:** English

**Citation:** Abdul Lateef ZW, Ahmed KA, Al Marjani MF (2016) WAKE EFFECTS INDUCED IN LIQUID WATER BY HYDROGEN-DICLUSTER IONS. ISJ Theoretical & Applied Science, 01 (33): 26-30.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-6> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.6>

### Introduction

Since the discovery of radiation, the interaction of ionizing radiation with living tissues has become of prime interest in many branches such as: medical physics, oncology, radiation protection and astrophysics. The interaction of energetic charged particles with biological medium is primarily through coulomb forces resulting in losing energy to their environment by ionizations and excitations of the atoms and molecules within the cell, secondary electrons and radicals are formed thus; further ionizations are induced near the primary path of the particle.

Liquid water is present in all living matter (70–80% in soft tissue) [4], Most of the living tissue of a human being is made up of water; it constitutes about 92% of blood plasma, about 80% of muscle tissue, about 60% of red blood cells, and over half of most other tissues.

When ionizing radiation passes through living tissue, electrons are removed from neutral water molecules to produce H<sub>2</sub><sup>+</sup>O ions, the radicals formed

when ionizing radiation passes through water are among the strongest oxidizing agents that can exist in aqueous solution.

One of the significant processes that take place between the cluster ions and the target interactions is the induced wake potential, the dielectric formulation that deals with such studies that describes the way these interactions take place in which it is specified in terms of the induced wake potential gives the response of the medium to the perturbation created by the moving cluster ion [5-7]. The passage of a cluster projectile through a target generates an electric potential where the coulomb field of the moving cluster ions polarizes the electron density around the projectile path in the target causing the dissociations of the electrons from their equilibrium positions [8]. In clusters, the electric potential gives rise to further disturbance in the transport of electrons produced by other cluster ions [9].

In current study, a detailed calculation of the induced wake have been made particular in the dynamical interactions among hydrogen dicluster correlated and self-ions moving in the H<sub>2</sub>O in



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incident energy range (0.05, 0.25, 1.0, 2.0, and 2.5) MeV, taking in consideration the damping using the random phase approximation, RPA dielectric function to represent the response of the biological medium.

### Wake Potential of Swift Hydrogen-Dicluster Ions

Electronic excitations will be induced by an energetic swift hydrogen dicluster ions passing through H<sub>2</sub>O, an accompanying wake potential ( $\phi_{ind}$ ) will appear in the neighborhood of the external H<sub>2</sub><sup>+</sup>-

$$\phi_{ind} = \frac{Z_1}{2\pi} \int \frac{d^3k}{k^2} e^{i\vec{k} \cdot \vec{r}} \left[ \frac{1}{\epsilon(\vec{k}, \vec{k} \cdot \vec{v})} - 1 \right] \quad (1)$$

Where  $\phi_{ind}$  is the induced potential,  $\vec{r}$  is the vector measured from the instantaneous of the proton.

ion as it passes through the stopping medium. As a result, a retarding force acts on the H<sub>2</sub><sup>+</sup>- dicluster ion and causes it to lose energy.

Since the induced wake potential produced by a proton of velocity  $\vec{v}$  moving through a material characterized by its dielectric properties  $\epsilon(\vec{k}, \omega)$ , [using Drud's dielectric approach in the present study] is expressed as [10]:

To redefine the wake potential for hydrogen dicluster ions, one can start from the following simple formula:

$$\phi_{ind} = -Z_i e \int \vec{E} \cdot d\vec{r}, \quad d\vec{r} = \vec{v} dt \quad (2)$$

Where  $Z_i e$  is the charge of the stopping medium,  $\vec{E}$  is the electric field multiplied by a differential change of the distance. And since the stopping power of a dicluster is represented as the following equation [11],

$$S_{clu}(q) = S_s(q) + S_{corr}(q) \quad (3)$$

Then insertion of Eq. (3) into Eq. (2) with  $d\vec{r} = \vec{v} dt$  yields the following expression for the induced potential,

$$\phi_{ind} = \sum_j \frac{2Z_j e}{\pi v} \sum_i Z_i e \int \frac{-\vec{k} \cdot d\vec{k}}{k^2} |\rho_q(k)|^2 \int d\omega \left[ \text{Cos}(\vec{k} \cdot \vec{r}_{ji}) \text{Re} \left[ \frac{1}{\epsilon(\vec{k}, k \cdot v)} \right] - \text{Sin}(\vec{k} \cdot \vec{r}_{ji}) \text{Im} \left[ \frac{1}{\epsilon(\vec{k}, k \cdot v)} \right] \right] \quad (4)$$

Where:  $|\vec{k}| = \frac{w}{v}$   
 $\vec{k} \cdot \vec{r}_{ij} = \frac{w}{v} r$   
 $\vec{r}_{ji} = \vec{r}_j - \vec{r}_i$

From the condition of dielectric function:  
 $\epsilon(-\vec{k}, -\omega) = \epsilon^*(\vec{k}, \omega)$ .

The imaginary part in Eq. (4) is dissipative because:

$$\phi_{ind} = \sum_j \frac{2Z_j e^2}{\pi v} \sum_i Z_i \int \frac{\vec{k} \cdot d\vec{k}}{k^2} |\rho_q(k)|^2 \int d\omega \left[ \text{Cos}(\vec{k} \cdot \vec{r}_{ji}) \text{Re} \left[ \frac{1}{\epsilon(\vec{k}, k \cdot v)} \right] \right] \quad (5)$$

The next step is to drive the induced potential for H<sub>2</sub><sup>+</sup>- dicluster ions by separating the terms  $i = j$  for self-ions and  $i \neq j$  for correlated ions of the inter-

$$\text{Sin}(-\vec{k}, \vec{r}_{ji}) = -\text{Sin}(\vec{k}, \vec{r}_{ji})$$

$$\text{Cos}(-\vec{k}, \vec{r}_{ji}) = \text{Cos}(\vec{k}, \vec{r}_{ji})$$

It is important to keep in mind that the induced potential is written in real form and the force is written in imaginary form therefore, Eq. (4) becomes,

nuclear separation  $\vec{r}_{ji}$  and by summing up them together we get,

$$\phi_{ind} = \frac{2e^2}{\pi\nu} \int_0^\infty \frac{d\vec{k}}{k} |\rho_q(k)|^2 \int_0^{\vec{k} \cdot \vec{v}} d\omega \operatorname{Re} \left[ \frac{1}{\epsilon(\vec{k}, \vec{k} \cdot \vec{v})} \left[ \sum_i z_i^2 + \sum_{i \neq j} z_i z_j \operatorname{Cos}(\vec{k} \cdot \vec{r}_{ji}) \right] \right] \quad (6)$$

$$= \phi_{self} + \phi_{correlated}$$

Where,

$$\phi_{self} = \frac{2e^2}{\pi\nu} \int_0^\infty \frac{d\vec{k}}{k} |\rho_q(k)|^2 \int_0^{\vec{k} \cdot \vec{v}} d\omega \operatorname{Re} \left[ \frac{1}{\epsilon(\vec{k}, \vec{k} \cdot \vec{v})} \sum_i z_i^2 \right] \quad (6a)$$

$$\phi_{corr.} = \frac{2e^2}{\pi\nu} \int_0^\infty \frac{d\vec{k}}{k} |\rho_q(k)|^2 \int_0^{\vec{k} \cdot \vec{v}} d\omega \operatorname{Re} \left[ \frac{1}{\epsilon(\vec{k}, \vec{k} \cdot \vec{v})} \left[ \sum_{i \neq j} z_i z_j \operatorname{Cos}(\vec{k} \cdot \vec{r}_{ji}) \right] \right] \quad (6b)$$

Where  $\rho_q(k)$  the Fourier is transform of the projectile charge density  $\rho_q(r)$  for the charge state  $q$  and is given in the following equation,

$$\rho(q) = \frac{q + (k\lambda)^2}{(k\lambda)^2} \quad (7)$$

In present work we will calculate the self and correlated wake potential for each element in H<sub>2</sub>O then applying Bragg's rule to the correlated. A computer program "Zanb-cluster. For" has been written for numerical calculations liquid water [12]

### Results and Discussion

Results will be summarized and presented as figures; we shall try to demonstrate the effects of wake potential on H<sub>2</sub>O following the dielectric formalism, calculations has been made for wake potential produced by a moving H<sub>2</sub><sup>+</sup>-dicluster ions

through H<sub>2</sub>O target. The wake potential for single and correlated ions has been calculated using Eq. (6). These calculations were made without comparing with experimental data because of the lack in such data for H<sub>2</sub>O target.

Figure (1) represents the variation of induced wake potential for self-interaction  $\Phi_s$ , with charge exchange,  $q$  in liquid water. For liquid water, at  $q \rightarrow 1$  where H<sub>2</sub><sup>+</sup>-dicluster ions are fully ionized, the maximum differences between the values of self-wake potential is about  $\approx 10\%$ . Also, it has been noted in H<sub>2</sub>O that at  $q = 0$  the wake potential was  $\Phi_s = 0.0038$  a.u.

This difference in  $\Phi_s$  of H<sub>2</sub>O is probably due to combination of its structure and the collective effect (vicinage effect) between H<sub>2</sub><sup>+</sup>-dicluster ions in one hand and with the target material in another hand Fig.1.

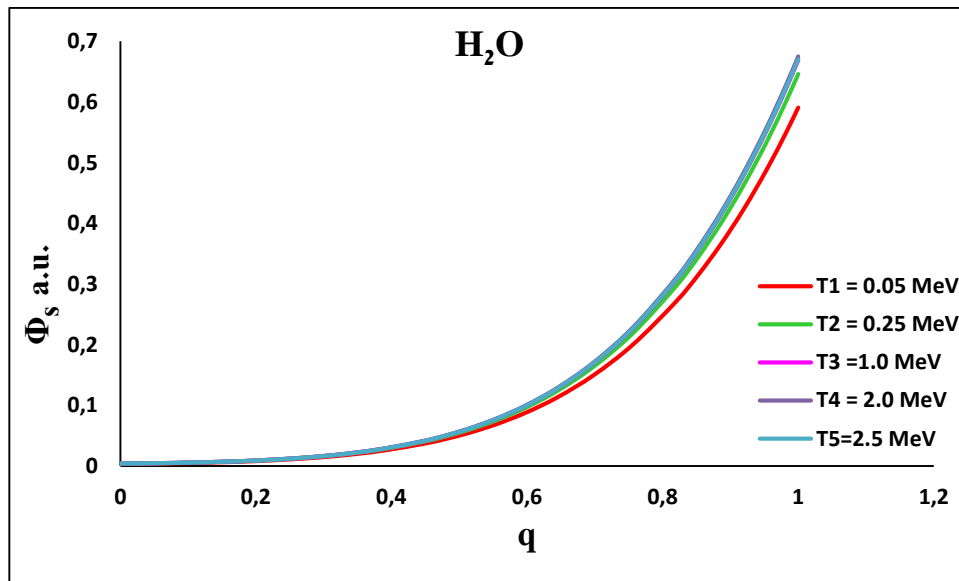


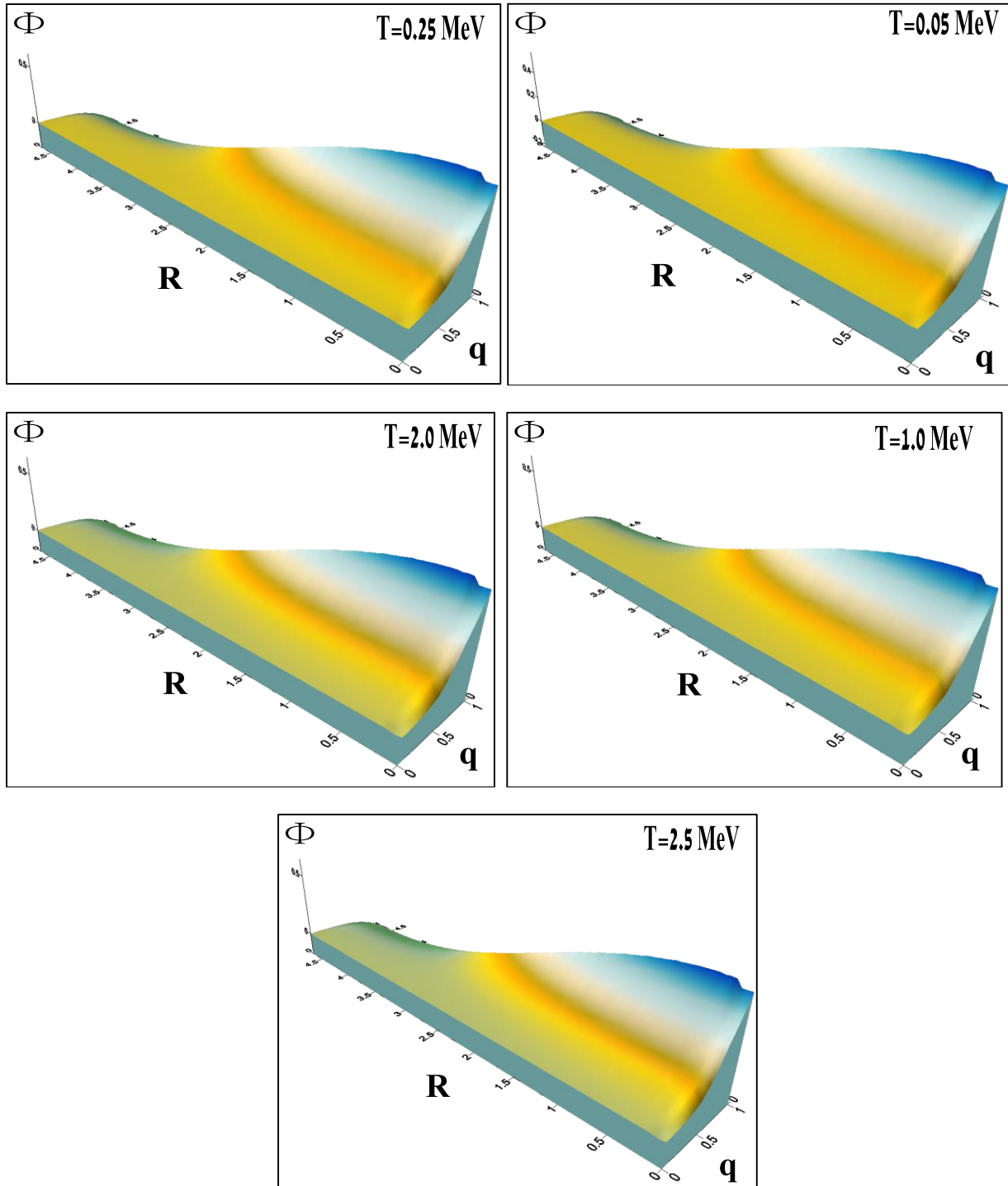
Figure 1 - Self-Induced wake potential,  $\Phi_s$  versus charge fraction,  $q$ , at five different incident H<sub>2</sub><sup>+</sup>- dicluster ions energies (0.05, 0.25, 1.0 2.0, 2.5) MeV for H<sub>2</sub>O.

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It is seen very clearly from Fig. (2) that the correlated potential of H<sub>2</sub>O is affected by the charge fraction q, and the inter-nuclear distance R, at five incident energies of H<sub>2</sub><sup>+</sup>-dicluster ions T<sub>i</sub> (0.05, 0.25, 0.1, 0.2, and 2.5) MeV. At R → 0, the wake potential increases with increasing charge exchange, q until it

reaches its maximum, while at R → ∞, the wake potential becomes independent of q as shown in figure below. The  $\Phi_{corr}^{H_2O}$  spectrum was decreasing as R increased dropping to the lowest value at R ~ 3.



**Figure 2 - Induced wake potential  $\Phi_c$  for correlated interaction versus charge fraction, q, at five different incidents H<sub>2</sub><sup>+</sup>- dicluster ions energies (0.05, 0.25, 1.0, 2.0 and 2.5) MeV for H<sub>2</sub>O.**

### Conclusion

The results of current study reveal that both self and correlated hydrogen dicluster ions produce spatial ionizations and excitations of electrons along their penetration path inside the target H<sub>2</sub>O spatially at the Bragg region. It is seen from results throughout the whole work that the correlated term of H<sub>2</sub><sup>+</sup> dicluster ions is strongly influenced by the inter-nuclear distance R, and with charge exchange q.

From the point of view of cluster-atom collisions and by using the results of this study, the spatial collective effects of the induced wake potential and the other important physical processes resulted after H<sub>2</sub><sup>+</sup>-dicluster ions- H<sub>2</sub>O interaction, such as energy loss, energy loss straggling, charge exchange and other processes, it is expected that the initial structures of both the hydrogen dicluster ions and the H<sub>2</sub>O is to be rearranged thus, leading to the changing in their characteristics which agrees with the work of Garcia et.al 2005 [13].

Since water makes up most of the cell's volume (about 70 %) Therefore, the probability of radiation beam interacting with the cellular water is much higher thus producing free radical and active oxygen species that follows a cascade of events [14]. At the molecular level, these oxidizing agents destroy critical biological targets such as DNA by either removing electrons or removing hydrogen atoms which often leads to base damage BD, single-strand breaks SSB and double- strand breaks DSB of DNA [12, 15].

The results of this study reveals that at malignant cells, the DNA environment will be modified after irradiation with H<sub>2</sub><sup>+</sup>-dicluster ions by neutralizing the free radicals that exits at the same tumor cells, thus, these cells eventually will be killed and as a general result a cure from cancer disease is obtained in a quick and conformable way without needing to surgical interference.

The effects of water radicals are responsible for about 65 % of cellular DNA damage, while the direct effects contribution are about 45 % [16].

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SJIF (Morocco) = 2.031

ICV (Poland) = 6.630  
PIF (India) = 1.940

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>



**Denis Alexandrovich Chemezov**  
Master of Engineering and Technology,  
Corresponding member of International  
Academy of Theoretical and  
Applied Sciences, Lecturer of  
Vladimir Industrial College,  
Russian Federation  
[chemezov-da@yandex.ru](mailto:chemezov-da@yandex.ru)



**Nikita Andreevich Palev**  
Student of  
Vladimir Industrial College,  
Russian Federation  
[nik-palev@yandex.ru](mailto:nik-palev@yandex.ru)

SECTION 7. Mechanics and machine construction.

## INJECTION MOLDING OF A PLASTIC GEAR WHEEL DURING THE CHANGE OF THE TECHNOLOGICAL MODES OF PROCESS

**Abstract:** The article presents the analysis of time of the molten material is filled in the mold for production of cylindrical gear wheel when changing temperature modes of the technological process.

**Key words:** injection molding, molding time, a gear wheel, a plastic, temperature.

**Language:** Russian

**Citation:** Chemezov DA, Palev NA (2016) INJECTION MOLDING OF A PLASTIC GEAR WHEEL DURING THE CHANGE OF THE TECHNOLOGICAL MODES OF PROCESS. ISJ Theoretical & Applied Science, 01 (33): 31-34.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-7> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.7>

УДК 621.74.043.2

### ИНЖЕКЦИОННОЕ ЛИТЬЕ ПЛАСТИКОВОГО ЗУБЧАТОГО КОЛЕСА ПРИ ИЗМЕНЕНИИ ТЕХНОЛОГИЧЕСКИХ РЕЖИМОВ ПРОЦЕССА

**Аннотация:** В статье представлен анализ времени заполнения расплавленным материалом литейной формы для изготовления цилиндрического зубчатого колеса при изменении температурных режимов технологического процесса.

**Ключевые слова:** инжекционное литье, время литья, зубчатое колесо, пластик, температура.

Зубчатые колеса, находящиеся в зацеплении и имеющие различное по скорости вращательное движение для преобразования (увеличение или уменьшение) крутящего момента и числа оборотов валов на входе и выходе, называются зубчатой передачей [1].

Выбор материалов зубчатых колес зависит от условий эксплуатации механической передачи. В качестве материалов могут применяться металлические сплавы для средне- и тяжелонагруженных зубчатых колес и неметаллические материалы – для малонагруженных зубчатых колес [2]. Ограниченное применение пластмассовых зубчатых колес компенсируется быстроходностью и бесшумностью работы передачи, высокой износостойкостью зубьев при отсутствии смазки между контактными поверхностями, а также устойчивостью в агрессивных средах.

Все способы изготовления зубчатых колес можно разделить на механическую обработку заготовки лезвийными и абразивными режущими инструментами, обработку давлением заготовки в холодном и горячем состоянии и литье под давлением (инжекционное литье) [3]. Инжекционное литье является высокопроизводительным способом получения зубчатого колеса из пластмассы (пластика). На качество отливки будет влиять равномерность заполнения материалом литейной формы (месторасположение инъекции, скорость впрыска и температура материала, конфигурация и степень точности изготовления формы и др.). Так как наиболее нагруженными и точными элементами детали являются зубья, то исследование процесса инжекционного литья при различных температурах расплавленного материала позволит определить время и полноту заполнения формы на более ответственных участках.

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Для расчета были приняты следующие параметры цилиндрического прямозубчатого колеса [4]: количество зубьев  $z = 17$ ; модуль  $m = 5.5$  мм; диаметр делительной окружности  $d = 93.5$  мм; диаметр окружности вершин  $d_a = 104.5$  мм; диаметр окружности впадин  $d_f = 79.75$  мм; высота головки зуба  $h_a = 5.5$  мм; высота ножки зуба  $h_f = 6.875$  мм; полная высота зуба  $h = 12.375$  мм; шаг зацепления колеса  $P_t = 17.27$  мм; толщина зуба  $S_t = 8.635$  мм; ширина зуба  $b_s = 12$  мм; ширина впадины  $E_t = 8.635$  мм;

толщина зуба по окружности вершин  $S_a = 4.7$  мм; радиус сопряжения во впадине зуба  $r_c = 0.3$  мм; фаска на зубьях и в посадочном отверстии  $1.2 \times 45^\circ$ ; диаметр посадочного отверстия  $d_e = 32.8$  мм; ширина шпоночного паза  $b_w = 9$  мм; глубина шпоночного паза  $t_l = 4.5$  мм; радиус закругления шпоночного паза  $r = 0.5$  мм.

Общий вид объемной твердотельной модели цилиндрического зубчатого колеса представлен на рис. 1.

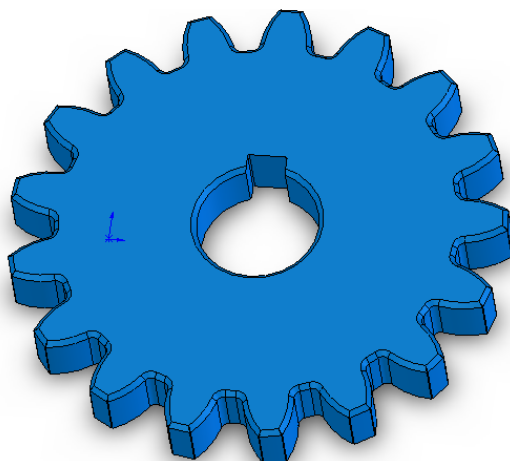


Рисунок 1 – Объемная твердотельная модель цилиндрического зубчатого колеса.

Зубчатое колесо изготавливалось методом инжекционного литья. Моделирование процесса литья зубчатого колеса выполнялось в модуле MoldflowXpress программной среды SolidWorks [5, 6]. Модуль позволяет выполнять моделирование потока пластика начального уровня с одной точкой литья. По результатам расчета можно определять заполнение детали на основе параметров геометрии, применяемого материала и выбранной точки инжекционного литья.

В модуле MoldflowXpress выполнялись следующие действия по установке начальных условий процесса литья:

1. На модели цилиндрического зубчатого колеса задавалась точка (рис. 2, а) определяющая местоположение инъекции (во вкладке «Отлив» отображение координат точки по трем координатным осям). Точка выбрана на торцевой поверхности зубчатого колеса в области наиболее нагруженных элементов детали.

2. Выбор материала в одноименной вкладке. Материалом отливки принимался полиоксиметилен (ПОМ) – полуфабрикат, относящийся к группе технических термопластов. Выбор материала обуславливался высокой способностью сохранения формы,

упругостью и незначительным впитыванием влаги. ПОМ обладает следующими физико-механическими свойствами [7]: твердость – 82 SHORE D [8]; плотность – 1,4 г/см<sup>3</sup>; жесткость при шаровом давлении – 135 Н/мм<sup>2</sup>; натяжение при вытягивании – 62 Н/мм<sup>2</sup>; растяжение при вытягивании – 8...10%; прочность на растяжение – 40%; ударная вязкость при +23°C – 70 кДж/м<sup>2</sup>; ударная вязкость при -30°C – 40 кДж/м<sup>2</sup>; коэффициент трения (на сухую против стали, динамический) – 0,17 – 0,43; минимальная температура применения – -50°C; максимальная температура применения – +100°C.

3. Выбор условий процесса инжекционного литья. Для 7 компьютерных экспериментов по определению времени литья зубчатого колеса температура литейной формы оставалась постоянной и составляла 90°C. Температура расплавленного материала изменялась в диапазоне 180...240°C с шагом 10°C.

4. Сохранение данных и запуск анализа течения пластического материала в литейной форме. Время литья определяется после расчета.

Результаты моделирования инжекционного литья цилиндрического зубчатого колеса при температуре материала 210°C представлены в виде интерактивных эпюр на рис. 2, б – з.

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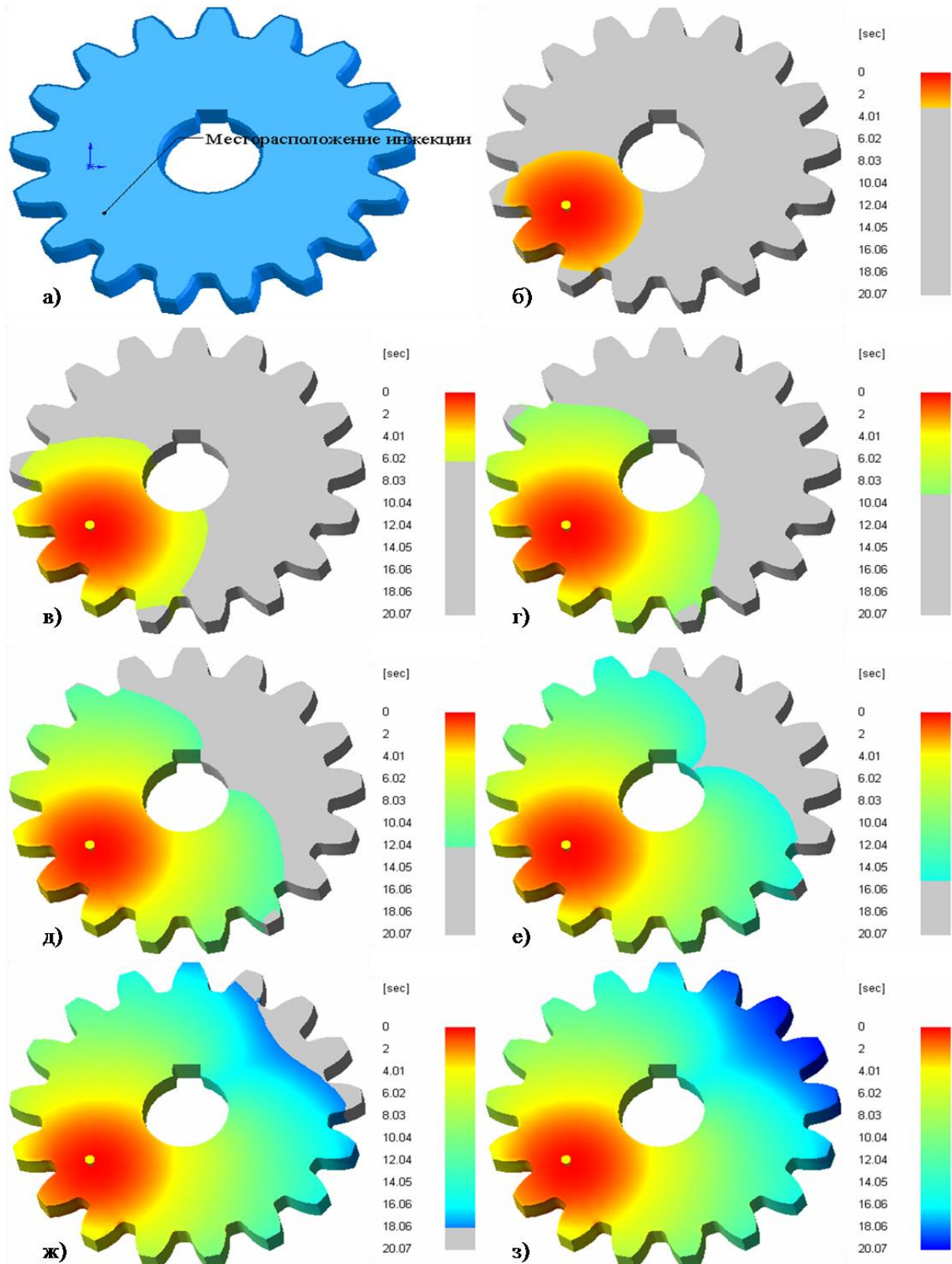


Рисунок 2 – Результаты компьютерного моделирования процесса литья цилиндрического зубчатого колеса при температуре материала 210°C: а – месторасположение инъекции расплавленного пластика; б – заполнение литейной формы материалом на 15%; в – заполнение литейной формы материалом на 30%; г – заполнение литейной формы материалом на 45%; д – заполнение литейной формы материалом на 60%; е – заполнение литейной формы материалом на 75%; ж – заполнение литейной формы материалом на 90%; з – заполнение литейной формы материалом на 100%.

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Процесс литья визуально отображается на модели детали цветовыми контурами. Цвет контура показывает последовательность заполнения литейной формы и характер течения пластика через деталь: красный указывает первую область заполнения, синий – последнюю область заполнения.

Зубья колеса заливаются пластиком в полном объеме. Однако, температура пластика в

симметрично выливаемых зубьях колеса будет меньше, чем в зубьях, расположенных в области впрыска материала.

В целом деталь легко и полностью заливается, качество приемлемое при текущей точке инъекционного литья.

Расчетное время литья зубчатого колеса при различных температурных режимах представлено в табл. 1.

**Таблица 1**  
**Время литья зубчатого колеса при изменении температуры расплавленного материала.**

Температура материала, °С	Температура литейной формы, °С	Время литья, с
180	90	30.1
190		25.07
200		25.08
210		20.07
220		20.06
230		19.06
240		18.06

С увеличением температуры пластика уменьшается время литья зубчатого колеса. Это связано с уменьшением вязкости и увеличением скорости течения материала в литейной форме. На температурных интервалах 180-190°С и 200-210°С наблюдается сокращение времени литья детали на 5 с. Производительность процесса инъекционного литья не изменяется на интервалах 190-200°С и 210-220°С. При температуре материала более 220°С время литья сокращается на 1 с.

Таким образом, наиболее рациональный температурный режим инъекционного литья зубчатого колеса будет составлять 210-220°С для материала и 90°С для литейной формы. Увеличение или уменьшение температуры материала не рекомендуется для технологического процесса инъекционного литья, так как это может привести к изменению химического состава и механических свойств, требуемых для данной детали.

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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Munira Mahamadjanovna Kaharova**

Senior researcher

“National idea and social philosophy” Dept.

The Mirzo Ulugbek National University of Uzbekistan

Tashkent, Uzbekistan

[naumenko06@mail.ru](mailto:naumenko06@mail.ru)

### SECTION 30. Philosophy.

## PHILOSOPHICAL-LEGAL FOUNDATIONS OF THE IDEAS OF PLURALISM AND THE MULTIPARTY SYSTEM (ON THE EXAMPLE OF UZBEKISTAN)

**Abstract:** In this article some interested philosophical-legal points of view on the ideas of pluralism and the multiparty system in Uzbekistan are considered. Philosophy of law pays a big attention to these questions.

**Key words:** philosophy of law, the Republic of Uzbekistan, the Constitution, law, pluralism, multiparty system.

**Language:** English

**Citation:** Kaharova MM (2016) PHILOSOPHICAL-LEGAL FOUNDATIONS OF THE IDEAS OF PLURALISM AND THE MULTIPARTY SYSTEM (ON THE EXAMPLE OF UZBEKISTAN). ISJ Theoretical & Applied Science, 01 (33): 35-43.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-8> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.8>

In the modern world, experiencing a fundamentally important and new stage in its development, searching for new approaches of formation and development of political systems, the modernization and democratization of state and social structure. There is an intense search to find their own model of promoting democracy, civil society and progress, the possible ways to achieve it taking into account the peculiar characteristics of each people and society.

Uzbekistan has refused the imposed shocks, deceptive ideas about self-regulation of the market economy and chose the evolutionary approach in the transition from administrative-command towards market system of management, the path of gradual and phased reforms, acting upon known principles of "not having built a new house, don't destroy the old one" and "reforms not for reforms, but for the people".

On the basis of the fundamental provisions and requirements of the Constitution of the Republic of Uzbekistan was adopted its own model of fundamental reform and modernization of the country, five basic principles which underlie the current intense democratic, socio-political and economic development of the country, loyalty and wisdom which is fully confirmed by experience. They are the priority of economics over politics; the state in transition plays the role of the main reformer; the superiority of law; the implementation of strong social policy and the evolutionary in reforms.

Today it is possible to assert with confidence that the model enabled the evolutionary, without revolutionary and social upheaval to create the national statehood, to strengthen state sovereignty, to ensure sustainable and dynamic development of the political system, civil society, the national economy, to carry out deep democratic political, economic and social reforms. This shows the correctness of the chosen in the first years of independence own path of development and progress and underlying evolutionary and gradual modernization of society.

In the course of building a democratic legal state with a developed market economy, the formation of a strong civil society, the emphasis was on system development of a multiparty system, creation of conditions for the formation of an independent, stable, active, supported by wide sectors of the population political parties and other public associations. The analysis of the activity of political parties in Uzbekistan allows allocating following stages and features of their formation and development.

The first stage (1991-2000). On this stage of priority reforms and transitions and building the foundation of national statehood was solved the problem of the departure from the monopoly of ideology and policy one of the existing political parties. There have been created the necessary legislative and political conditions for the establishment of a multiparty system in the country.



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At this stage also addressed the following key task of modernising the country in the sphere of formation of a multiparty system.

First, a legislative conditions for the transition from monoparty socio-political system into a real multiparty system, from ideological fundamentalism – political pluralism.

The turning point in the creation of legislative, legal base for the formation in Uzbekistan of political pluralism and the multiparty system that meets international standards of parliamentary democracy was the adoption in 1992 of the Constitution of the Republic of Uzbekistan [1]. The Constitution enshrines a number of important initial concepts and principles, the place of political parties in the state power system. Especially: - the right of citizens to form political parties and other public associations, to participate in mass movements (Article 34), as well as the classification of political parties according to their legal form, public associations (Article 56); - protection of rights, freedoms and dignity of persons constituting an opposition minority in political parties, public associations, mass movements and in representative bodies (Article 34). This stipulates that no section of society, political party, public Association, movement or individual may speak on behalf of the people of Uzbekistan (article 10). Established the state's obligation to enforce the rights and lawful interests of public associations, creation of equal legal opportunities for participation in public life and the prohibition of intervention of state bodies in the activity of public associations (article 58); - the ban on creation and activity of political parties and other public associations, aimed at forcible change of the constitutional system, undermining state sovereignty, integrity and security of the Republic, constitutional rights and freedoms of citizens, propagandizing war, social, national, racial and religious enmity, encroaching on the health and morality of the nation, as well as paramilitary organizations and political parties based on ethnic and religious grounds, secret societies and associations (article 57); - define political parties as organizations that Express political will of various social strata and groups and through their democratically elected representatives shall participate in the formation of state authority (article 60).

Thus, the Constitution in 1992 created a solid legal basis for the formation of a new political system of society on a multiparty basis, decide the most important tasks of the transition period — the development and strengthening of democratic institutions such as branched multi-party system and other social organizations, designed to represent interests of various strata of the population. The role of the state in the formation of civil society was to eliminate any obstacles and barriers that impede the emergence, formation and development of political

parties and social movements, which provide for a representative democracy.

The Law "On political parties" enacted in 1996 [2] has established the necessary legal framework for the effective functioning of multi-party system, securing the provision that none of the existing parties can claim the sole right to determine the policy of the state. The adoption of the law legally enshrines growing diversity and a broad range of new political standing of the society, allowed to gradually develop the structure of social organizations designed to maintain a balance of interests in the country.

There was established the principle of voluntary association of citizens in political parties on the basis of their common views, interests and goals. Political parties were guaranteed the right to propagate their ideas, goals and objectives, participate in training relevant government decisions, elections of bodies of state power, to establish their own mass media, to form their factions in the legislative body, organized to achieve its program goals and objectives.

Secondly, provided legal guarantees for the transition from an electoral system based on the "leading role" of the party direct political action, to a multi-party electoral system that meets widely accepted standards. There was created the necessary legal framework to ensure the most important principle of democracy – the right of choice, free will of the people, participation of citizens in managing the affairs of the state and society.

The first Law "On elections to the Oliy Majlis of the Republic of Uzbekistan" [3], adopted on 28 December 1993, already possible at that stage of reforms consistent with the widely accepted standards of organizing and holding multiparty elections. With the adoption in 1994 of the laws "On guarantees of electoral rights of citizens" [4], "On elections to regional, district and city Kengashes of people's deputies" [5] and other acts of legislation, the country has developed, consistent with democratic requirements of the electoral system.

There have been established organizational and legal, material and technical conditions for free, active participation of citizens, political parties in the electoral processes, reliable guarantees of full realization of their voting rights.

All this has become the lynchpin of the entire work on the formation of a fundamentally new state arrangement, provision of the democratic separation of powers, the formation and development of genuine multi-party system.

For the first time in the history of Uzbekistan on the basis of a new electoral law in December 1994 were held open democratic elections to a new Parliament – the Oliy Majlis, also formed a new constitutional-legal framework in terms of separation of powers and multi-party system.

## Impact Factor:

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Elections were held with the active participation of citizens in each electoral district ran two or three candidates and the voters were given the right of a real choice. High about democracy and organization of the electoral process in this period and indicates that the 250 parliamentary seats were contested 634 candidates from two political parties – people's democratic party and party "Vatan Taraqqiyoti", and from local representative bodies [6].

Furthermore, elections have completed an important stage in the establishment of a new system of state power. Was implemented the constitutional principle of separation of powers, strengthened the Executive and judicial branches of government.

According to the results of the 1994 elections, the most significant place in the Oliy Majlis took the people's democratic party received 69 seats, then the party "Adolat" - 47 seats and "Vatan Taraqqiyoti" - 14 seats, i.e. political parties together had a majority of seats in the Parliament [7].

Overall, during this period the country has developed the foundations of a new democratic political system, ensuring wide participation of citizens in managing the affairs of the state and society. There has been dynamic growth of the political and social consciousness of citizens, the rise of their political activism that, in turn, contributed to increasing the role and importance of parties in state and public life.

These changes have created a fundamentally new legal framework for the upcoming parliamentary elections in 1999, during which parliamentary seats in the Oliy Majlis of the second convocation has fought five political parties, initiative groups of citizens and candidates from local representative bodies of state power. The elections themselves were characterized by a higher level of competition of candidates (in some districts their number has reached 7 people) and the increased demands on them by voters.

In the activity of the Oliy Majlis of the second convocation were registered and became operational fractions of all political parties represented in Parliament, has been the development of factional activity. The number of political parties represented in the Parliament were: the National democratic party "Fidokorlar" - 53 seats (in April 2000 in view of commonality of political goals and interests have merged with the NDP "Fidokorlar" and "Vatan Taraqqiyoti", which, in turn, subsequently, in 2008, merged with the party "Milly Tiklanish"), PDPU — 49, the Social democratic party "Adolat" - 11 and Democratic party "Milly Tiklanish" - 10.

Thus, the 1999 elections, becoming a significant step forward in democratic reformation of the country, simultaneously revealed the need not only for further improvement of normative-legal regulation of the electoral processes, but also in

qualitatively new approaches to the organization of representative government.

Third, it initiated the formation corresponding to modern requirements of democratic parliamentary system, adopted comprehensive measures to enhance the role of the legislature in the structure of political institutions, the consistent expansion of the functions and powers of Parliament as creating the necessary socio-political conditions, more political, legal consciousness and legal culture of the population.

The Parliament in cooperation with the other branches of government became the guarantor of the preservation of political stability, peace and tranquility, was located in the center of all renewal processes in the socio-political, spiritual and cultural life of the country, creation of legislative base of reforms and consistent implementation of these tasks.

The Oliy Majlis has achieved tangible results in the sphere of forming the legal basis of civil society, institutional framework for the protection of human rights. In order to ensure parliamentary control over the effective implementation of existing legislation on human rights in the Republic of Uzbekistan state bodies, local authorities, enterprises, institutions, public associations and officials, in 1995, Parliament created the Ombudsman of the Oliy Majlis for human rights (Ombudsman).

Thus, conditions were created for transition to a subsequent stage of reform, and the logical result of the first stage was the preparation and holding of elections to the Oliy Majlis of the second convocation (1999).

The second stage (2000-2010). The period of active democratic renewal and modernization of the country is characterized by the accumulation of parties political experience and political maturity, ensure their financial autonomy, determining their own place in society and their permanent electorate.

The main tasks in the area of further development and strengthening of multi-party system that were solved at this stage of the reforms was limited to the following: creation of necessary conditions for improving political, the economic activity of citizens and the realization of man; further strengthening and promotion of the rights and freedoms, democratic values in the minds of people; improving the system of state and public institutions aimed at protecting the rights and freedoms of citizens; ensuring pluralism of opinions and freedom of expression.

At that time it was necessary to ensure that the multi-party system actually came into the life of society and to lay the foundations of a competition of views and ideas, to create a new political field of rivalry between the parties.

It is particularly noteworthy that on the eve of independence, the foundations of a new market economy, mechanism of market economic relations with the creation of institutes of market infrastructure

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and a competitive environment, revitalization and priority development of private property, has had a significant impact on the structure of society as a whole. Due to the privatization and full privatization of key sectors of the economy, trade, the service sector in the country actually formed a mixed economy, in which increasingly large role played by small business and private entrepreneurship, private farms and dekhkan farms. The share of small business and private entrepreneurship in GDP has increased from 1.5% in the early 1990-ies to 31% in 2000 and 38.2% - 2005[8].

In the end, the country appeared and began to grow a new class of owners-entrepreneurs, which from year to year began to play an increasingly important role in the life of the country. It is the middle class of owners has become a mainstay form of civil society began to play a crucial role in state and public construction, maintaining and strengthening socio-political stability, the formation of an economically sustainable and stable society. As a result, in the political field of the country arose a new Movement of entrepreneurs and businessmen – Liberal Democratic Party of Uzbekistan (UzLiDeP), which represents and protects the interests of the middle class of owners, entrepreneurs and farmers, etc.

Positive impetus to the increase of political activity of parties stressed the adoption of the law "On financing of political parties" [9], which created the possibility of legal regulation of financing of political parties. The sources of their funding were also assigned entrance and membership fees, profits received from entrepreneurial activity, the state budget and donations of legal entities and citizens of the Republic.

While the inclusion of financing parties from the state budget has provided an important stimulus for the activity of political parties, increasing demands from voters to parties and candidates they voted for a more efficient implementation of those social programs that meet the vital interests of the voters.

Since 2005, the government began the funding of political parties for the exercise of their statutory activity. The basic principles of funding political parties in this case determined the legality and transparency. The amount of subsidies allocated to a particular party is determined by the presence of the faction, and obtained seats in the Legislative chamber.

This has led to a significant intensification of the statutory activities of parties in local organizations. Started to develop the necessary organizational prerequisites for the strengthening of their work among the electorate and expand the activities of party groups in the deputy corps of the local Kengashes of people's deputies.

Parliamentary reform also entailed corresponding changes in the electoral system, which allowed to strengthen the participation of political parties in elections to representative bodies of power. In particular: - it was determined that candidates will be nominated from representatives from political parties and initiative groups of citizens (the excluded provisions for the nomination of candidates for deputies of local representative bodies of state authority); - improved a number of other rules governing the participation in elections of political parties. In particular, it was stipulated that women should constitute at least 30 percent of candidates nominated from political parties.

For the parliamentary elections of 2004 was improved election system that meets international standards. On 26 December 2004 General elections ensured the practical implementation of parliamentary reforms, has demonstrated the efficiency of the reformed electoral system, ensuring full representation in the newly elected Legislative chamber of all 5 existing in the country political parties. Participated in the last elections political parties already had a prominent political personality.

During elections, the UzLiDeP of the 120 seats in the Legislative chamber received 41, the People's Democratic Party (PDP) – 28, the NDP "Fidokorlar" - 18, DP "Milliy Tiklanish" – 11, SDP "Adolat" - 10. This allowed all parties to form in the lower house of their own faction.

After the elections in the Jokargy Kenes of Karakalpakstan, regional and Tashkent city Kengashes of people's deputies were elected 823 deputies, including - 331 from UzLiDeP (40,2 %), 301 from the PDP Uzbekistan (36.6%) and 88 from NDP "Fidokorlar" (10,7%), 40 from the SDP "Adolat" (4,9%), 30 from " Milliy Tiklanish " (3,6%).

As a result of the 2004 elections in the lower house of Parliament, in the person of the faction UzLiDeP, received a relative majority of parliamentary seats, emerged the so-called "party of power". This was the incentive to, in order to more effectively promote bills related to the implementation of its programme priorities with the faction UzLiDeP joined the faction of NDP "Fidokorlar" and SDP "Adolat", creating a Democratic bloc, which amounted to a parliamentary majority. At the same time the people's democratic party of Uzbekistan declared itself in opposition to the parliamentary majority.

Thus, for the first time in the history of the country in the lower house of the Oliy Majlis were institutionalized parliamentary majority and opposition parliamentary minority, explicitly delineated the formation in Uzbekistan is typical for modern democratic parliamentarism branches of parliamentary balance of political interests. This marked the beginning of the formation in Parliament



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of a modern mechanism of competition and healthy competition, and also created conditions for further development of constructive rivalry between political parties in tackling critical socio-political challenges facing the society.

The key and critical importance in deepening democratic reforms was played by the adoption of the Constitutional Law "On strengthening the role of political parties in renewal and further democratization of state governance and modernization of the country". Today political parties have become the most important tool for increasing political and public activity of citizens, the expression of the will and opinions of the population, primarily during the implementation of the electoral processes, the formation of bodies of state power in the centre and in the field. Taken legal measures to the legislative definition of the status of the parliamentary majority and parliamentary opposition, to the election of the leaders of the parliamentary fractions Deputy Speaker of the Legislative chamber.

Adopted legal mechanisms have radically changed the role and place of political parties in organization of activity of the Parliament, as well as in the formation of bodies of representative and Executive bodies, exercising control over their activities.

The introduction, in particular, the mandatory procedure for holding consultations with the factions of political parties on the candidature for the post of Prime-Minister, is strictly regulated and the mechanism of its adoption by the Parliament is an important step towards deepening of democratic reforms in the sphere of state construction.

Crucial have provided by Constitutional Law the rights of the political party factions in the Legislative chamber to take the initiative about resignation of the Prime-Minister and party groups in local Kengashes – the initiative about resignation of the Governor of the region, which in itself is concrete evidence of the increased role of political parties in the country.

Election of 2009 was held subject to the provisions of the Law of the Republic of Uzbekistan from 2008 "On amendments and additions to some legislative acts of Uzbekistan in connection with improvement of legislation on elections" [11] and became an important stage in deepening the reforms on democratic renewal and modernization of the country.

In the electoral system of the country were made due to time requirements and international standards changes and additions aimed first of all at further liberalization and democratization of the election legislation. In particular, the growing role and influence of political parties, increasing the number of their authorized representatives participating in the election process, granting them additional rights and powers and, in General, the

empowerment of voters allowed to improve the electoral system that has received broad support from the international community.

As a result of the changes made to the electoral law, the results of the upcoming elections has been greatly expanded representation of citizens in the Legislative chamber of the Oliy Majlis of the Republic of Uzbekistan, where the number of seats increased from 120 to 150. This introduced a new principle aimed at the protection of the environment, rational use of natural resources and ensuring ecological safety of the population, according to which the Parliament is allocated 15 places for the deputies from the Ecological movement of Uzbekistan.

The legislation made other changes to improve the electoral system, which ensured compliance with the principles of a multiparty system, alternative, transparency, freedom and fairness of the electoral process.

Many local and foreign experts, who observed the elections in Uzbekistan in 2009, drew attention to the fact, as was the election campaign in conditions of inter-party discussion, battle of ideas and programmes proposed by political parties. More than 500 candidates represented four parties.

According to the results of the elections to the lower house of Parliament were elected from UzLiDeP – 53 seats (39.3%), from the PDP Uzbekistan – 32 seats (23.7%), from the DP "Milly Tiklanish" – 31 seats (23%) and from the SDP "Adolat" – 19 seats (14%). Thus, all 4 operating parties won sufficient number of seats and formed their parliamentary factions. There also has formed a group of deputies elected from the Ecological movement of Uzbekistan. The leaders of all party factions and parliamentary group were elected Vice-Speaker of the Legislative chamber.

As a result of the practical implementation of the provisions of the constitutional law "On strengthening the role of political parties in renewal and further democratization of state governance and modernization of the country" and changes to the electoral law, the results of the 2009 elections there has been a significant strengthening of party representation in elected bodies of state power, which contributed to a noticeable revitalization of the associations of parliamentary parties at all levels.

The third stage (2010 – present time). The President of the Republic of Uzbekistan Islam Abduganievich Karimov at the joint session of Legislative chamber and Senate of the Oliy Majlis of Uzbekistan on 12 November 2010 the Concept of further deepening democratic reforms and formation of civil society in the country marked the beginning of a new phase of democratic renewal of society and modernization of the country. As stressed by the head of state, adopted the Concept "... is a long - term Program of the interrelated political and



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economic reforms, democratization and liberalization of state power and governance, ensuring independence and autonomy of the judiciary, freedom of expression and information, freedom of choice and development of electoral system, formation of civil society in conditions of globalization and rapidly changing modern world".

For these purposes, on April 18, 2011 adopted the law "On amendments and additions in separate articles of the Constitution of the Republic of Uzbekistan (articles 78, 80, 93, 96 and 98)". In accordance with this act introduced a number of significant changes and additions to the Constitution aimed at: the creation of a system of government and governance based on a fundamentally new that meets the highest democratic principles, the legal mechanism of distribution of powers between President, legislative and Executive branches; the extension of authority and control functions of the Parliament over the activities of Executive bodies; strengthening the role of political parties in implementing parliamentary control over the activities of the government.

In accordance with this law, first, equipped with the fundamentally new constitutional procedure of appointment of Prime-Minister of the Republic of Uzbekistan. With the consolidation in the new wording of article 98 of the Constitution, the constitutional order, under which the candidate for Prime Minister nominated by the political party victorious in parliamentary elections, or more parties who have obtained an equal number of seats, is fundamentally changing the system of formation and functioning of the Executive branch. A decisive role here include such things as political parties, the most important institution of civil society, implements the constitutional mechanisms of direct democracy foreseen in the Constitution.

Secondly, for the first time in parliamentary practice was established by the Institute of vote of no confidence in the Prime Minister — the Prime Minister of the country, which in the case of the persistent contradictions between the Prime Minister and the Legislative chamber if they receive at least two thirds of votes of the total number accordingly of deputies of the Legislative chamber and Senate of the Oliy Majlis, the Parliament can issue a vote of no confidence to the Prime Minister. In this case the President takes the decision to release the Prime Minister from office. The adoption of a vote of no confidence leads to the resignation of the entire government.

This Institute entered in to reinforce the powers of Parliament to oversee the implementation of laws by bodies of Executive power and is intended to enhance the role of the legislature in the political system of the country and the government's responsibility for ensuring continuous and quality execution of adopted laws.

Thirdly, the right of the President of the Republic of Uzbekistan take decisions on matters within the competence of the Cabinet of Ministers of the Republic of Uzbekistan.

Fourthly, important of fundamental importance in deepening democratic reforms and other amendments to the Constitution. In particular, set the order in which the decrees of the President of the Republic of Uzbekistan on the appointment and dismissal of the Chairman of the accounting chamber shall be approved by the Senate, eliminates the provision in accordance with which the President can make decisions on issues referred to the competence of the Cabinet of Ministers.

These innovations in the Basic law significantly expand the possibilities of parliamentary control over the activities of agencies of the Executive branch, greatly enhance the role and place of Parliament in the system of bodies of state power, expand the powers and control functions of the legislative branch, increase the requirements on the quality of legislative and control-analytical work of the Supreme representative body of the country.

A serial implementation also creates conditions for a radical enhancement of the role of political parties in formation of bodies of Executive power, implementation of parliamentary control over their activities, considerable strengthening of political, inter-party competition — the most important component of a democratic society.

In accordance with the fundamental innovations in the Basic law was adopted several important legislative acts aimed at improving the activities of the Parliament, strengthening the role and influence of political parties in the implementation of socio-economic, socio-political reforms, upgrading and modernization of the country.

Essential in the solution of these problems is the adoption of the law "On introducing amendments and addenda to the Law of the Republic of Uzbekistan "On Regulations of the Legislative chamber of the Oliy Majlis of the Republic of Uzbekistan" [14] in April 2013. Its adoption was due to modern realities and the logic implemented in the country democratic reforms and transformations, which require further development and strengthening of the institutions of representative democracy, in particular the activities of the Parliament when taking into consideration, the preparation for the final discussion and adoption of laws and strengthening the role of parliamentary associations on these stages of the legislative process.

In accordance with the law the following changes and additions to the Regulations of the Legislative chamber:

First, the law includes a provision (Article 81), providing for the establishment of the Kengash of the Legislative chamber of the Coordination group on organization of consideration of introduced draft



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laws and drafts of other normative-legal acts of the employees of the staff of the Legislative chamber, designed to carry out registration (accounting) of submitted projects and to accompany them in all stages of review.

Secondly embodied a more democratic, open mechanism for the distribution of the received projects (Article 13), whereby the Kengash of the Legislative chamber at its meeting collectively defined by the Committee responsible for the preliminary consideration of the bill.

Thirdly, in order to provide the factions of political parties more effectively implement their responsibilities in law-making activity of the Legislative chamber establishes the procedure, according to which, along with the responsible Committee, the draft law in the same terms sent in the faction (Deputy groups). Factions are granted the right to proceed to the consideration of draft laws and other normative legal acts simultaneously with the responsible Committee. Without opinions and proposals of fractions (Deputy groups) on the bill, the Committee responsible has no right to impose an opinion.

This provision expands the rights of factions (parliamentary groups) for participation in the work on the draft law at all stages of the legislative process and allows them already at the stage of preliminary consideration of the bill to form its position based on the program goals of political parties, interests of the electorate, to defend their opinion on different provisions of the bill.

In general, the law will significantly improve the legislative process in the lower house of the Parliament by expanding the rights and powers of the factions of political parties in legislative activity, increased their role and responsibility in making laws.

In addition, it assures political parties of new, more effective mechanisms to Express their programming tasks, the protection of the interests of the electorate. It promotes the participation of political parties through the activities of their fractions in the legislative process, increasing their opportunities to influence decisions made by the chamber of decision at all stages of consideration of the bill, to articulate and defend their positions on the bill, based on program documents of their political parties and voters. Moreover, to strengthen the role and responsibility of political party factions in improving the quality of laws, from the point of view of mainstreaming in the standards of laws for the interests of all segments of the population.

The main meaning in the further liberalization of the political system, the development of a multiparty system and strengthening of inter-party competition has adopted the Law "On amendments and additions to some legislative acts of the Republic

of Uzbekistan" [15], including the Law "On political parties".

This act, firstly, the law more clearly defined the conditions and procedure of education of party groups, in particular, set a lower limit on the number of deputies required for their education in the Jokargy Kenes of Karakalpakstan, Kengashes of people's deputies of oblasts, Tashkent city and cities (regional centers) — at least five deputies.

Secondly, it is stipulated that the activities of the party groups shall be terminated in the following cases: own initiative of the party groups; the expiration of the term of office of the Jokargy Kenes of the Republic of Karakalpakstan or the Council of people's deputies; reduce the number of MPs included in the party groups, below the limit required for its formation; termination of activities of the concerned political party.

Thirdly, along with established by the applicable laws of power, the party groups are entitled to make proposals: - for candidates as chairmen and Vice-chairmen and members of committees or commissions of the relevant representative body; - on the hearing at the sessions of the Jokargy Kenes of the Republic of Karakalpakstan, the Council of people's deputies of report or information the head of a state organ, located on the corresponding territory, on issues of their activities. The decision was adopted if supported by more than half of deputies.

Fourthly, one of the most important innovation of the bill is set that the proposals of party groups on issues introduced in representative bodies, are subject to mandatory review. If we consider the so-called different weight representation of political parties in representative bodies of local authorities, it is the most important guarantee of strengthening the position of political parties having less number of members in the corresponding Kengash of people's deputies.

In April 2014, new amendments have been made and additions to the Constitution of the Republic of Uzbekistan [16], extending the role of the Legislative chamber and Senate of Oliy Majlis in the system of public authorities, strengthening their functions of control over the activities of the Cabinet of Ministers and Executive bodies, increasing the responsibility of the Cabinet of Ministers and local administration. They are a logical extension of the Concept of further deepening democratic reforms and formation of civil society, which incorporates an integrated analysis of distance traveled along the path of reforming the country and defined the targets and guidelines for the development of society and the state.

In particular, Article 78 of the Constitution is supplemented by a provision aimed at constitutional recognition of the powers of the Legislative chamber and Senate of Oliy Majlis of the Republic of



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Uzbekistan on the implementation of parliamentary control. The control of the legislature over the activities of Executive bodies increases the responsibility for the ongoing action for the realization of laws and decisions of the Parliament and, thus, leads to an improvement in the quality of their work. The proper discharge of the Executive power of the laws leads to the consolidation of democracy, since the implementation is based on the will of national solutions in accordance with this will deepen the awareness of the people of its role as the sole source of authority and increases his desire to influence public policy.

In addition, constitutional recognition of the powers to exercise parliamentary control will allow political parties represented in Parliament, improve the effectiveness of control over the entire system of Executive power — from government to local authorities and to strengthen their role and practical importance in social life. Most importantly, it will give political parties a much more significant and harder to defend the interests of their constituency and their mission.

In the frameworks of the implementation of the principle "from strong state to strong civil society" and the formation of the whole system to ensure public control over activities of state authorities, it is proposed to give constitutional status as the Institute of public control, which significantly enhances the role and importance of civil institutions in solving the major problems of development of the state.

Amendments to article 93 improve the mechanism of the constitutional principle of separation of powers and their effective interaction. Thus, it is proposed that the decision on the formation and abolition of ministries, state committees and other bodies of state administration with subsequent submission of decrees on these matters for approval by chambers of Oliy Majlis will be accepted by the President only upon submission of the Cabinet of Ministers of the Republic of Uzbekistan.

Also there was included a rule that a candidate for the post of Prime-Minister under the consideration and approval of his candidacy in Parliament is a programme of government action for the near and long term. Said addition will allow political parties to make an informed decision to determine its position in relation to the course and programmes of the government or its separate directions. It is of great importance for the further development of a multiparty system, inter-party competition and factional struggle, which are essential parts of a democratic society. This will be facilitated and provided for in the bill is the government's duty to annually submit to Parliament reports on major issues of social and economic life of the country.

In addition, increasing the role of political parties and Deputy groups in local Kengashes and the representative Deputy bodies will contribute to additions to the Article 103, providing for the placing on the khokim of region, district and city responsibility to present the relevant Kengash of people's deputies reports on important and topical issues of socio-economic development of the region, district, city, on which the Kengash of people's deputies to make appropriate decisions.

Add to Article 117, towards the constitutionalization of an independent system of democratic formation of the Central electoral Commission and the main principles of its activity, provide a more complete realization of constitutional rights of citizens to elect and be elected to bodies of state power, and reinforce the guarantees of the rights to freedom of expression.

Legal regulation of parties in Uzbekistan is the result of gradual evolutionary development of state-legal and political system of Uzbekistan; it is the steps along the path of advancement from a strong state to a strong civil society, in the development of real multi-party system, enhancing the activity of political parties, the succession to promote the goal.

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JIF = 1.500	SJIF (Morocco) = 2.031	

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Talantbek Tolibdjanovich Madumarov**

PhD in law, Docent  
Head of the “National idea, basis of spirituality  
and law education” department  
The Andijan State University  
Andijan, Uzbekistan  
[naumenko06@mail.ru](mailto:naumenko06@mail.ru)

### SECTION 32. Jurisprudence.

## SOME ASPECTS OF THE ORGANIZATIONAL AND LEGAL BASIS FOR MICROFINANCE (ON EXAMPLE OF UZBEKISTAN AND SOME OF THE CIS COUNTRIES)

**Abstract:** In this article some aspects of the organizational and legal basis of microfinance on the example of the Republic of Uzbekistan and the CIS countries are considered.

**Key words:** the Republic of Uzbekistan, banking-finance sphere, micro-finance, micro-credit institutions, legal regulation, the CIS.

**Language:** English

**Citation:** Madumarov TT (2016) SOME ASPECTS OF THE ORGANIZATIONAL AND LEGAL BASIS FOR MICROFINANCE (ON EXAMPLE OF UZBEKISTAN AND SOME OF THE CIS COUNTRIES). ISJ Theoretical & Applied Science, 01 (33): 44-46.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-9> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.9>

From the first days of independence, Uzbekistan has started the implementation of reforms in financial and banking sector. It was formed its own national banking and financial system of the country and created a unique mechanism for providing financial services. These show that while in the international financial system there are indications that various financial gaming and fraudulent competition, Uzbekistan has formed a reliable financial system and going that route. In this regard, the President of Uzbekistan Islam Abduganievich Karimov stated the following: “In the period of global financial and economic crisis the financial and banking system of the country has proved its stability and reliability. At the same time, strengthening this system connected with attraction of the private capital in the banking-financial sector at the expense of formation of legal bases in leasing on the basis of private banks and private property, financial institutions such as insurance companies, credit unions, microfinance organizations. Hence this gives an opportunity to enhance competition and improve the quality of customer service in the market of Bank and other financial services and creates conditions for the development of modern market infrastructure that meets the requirements of the highest international standards” [1].

The reforms of the 90-ies of the last century led to the development of entrepreneurship and economic liberalization and this are, in turn, served

to increase the demand for credit resources. However, during this period banking institutions have not yet reached sufficient development and could not provide a service for great part of the population that has not had a stable income and collateral.

Under these conditions, citizens are combining their financial and intellectual resources have formed associations, foundations, and credit institutions called “microfinance institutions”.

For the development of microfinance services as additional factors were carried out legislative reform in the CIS countries and adopted new regulations in this period, in almost all the CIS countries have passed laws regarding the civil code, credit unions, microfinance organizations and microcredit.

It should be noted that the emergence of micro-credit institutions and acquisition on market of the microfinance services is determined by the distinctive characteristics. This process was observed not efficiency initially formed to credit institutions and instead implement financial assistance of the economic subjects of small business and entrepreneurship, the goal of getting big benefits, and implementation of financial fraud. This, in turn, demanded the extension of the implementation in comparison with the credit unions microcredit institutions and its transformation into the organization, implementing effective financial



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provision of services for business structures. From this point of view, in the early twenty-first century began to form the institution of microcredit as a banking and non-banking institutions, and today's practice shows that the service they provide from the point of view of finance are effective and sustainable.

In this regard, it is to highlight the relevance of the activity of micro credit agencies as nonbanking organizations in the market of financial services.

It should be noted the provision of nonbanking entities or credit institutions unlicensed financial services to the population outside the banking control and according to this, the problem of determining the legality of the provision in different countries has its own characteristics. For example, in the U.S., the activity of some nonbanking organizations denying regulation by the Federal Reserve, argues that the services provided by them to attract and grant funds are not considered bank transaction. For this reason, from the point of view of legality, has developed explanations for the changing of notions (terms) the "commercial debt" and the "contribution" [2, 78 - 84].

Using the U.S. experience, it is possible to conduct a brief analysis of the role of micro financial institutions in economic development. In the 60-ies of the last century in America began, the Federal program of the "war against poverty" and its focus was on a specially designed credit schemes and models for the financing of small business, representatives of national minorities and other financially insecure groups of citizens. Later there was organized the Department of business development on a widespread implementation of microfinance schemes in practice and to date, these schemes have an important place in the economy of the United States [3].

In Russia and some of the CIS countries banks are not interested in providing services to citizens non-permanent employment and do not receive a regular income, or to persons who are not able to confirm the information on income in installed form. This explains the high risk of lending to this segment of the population and the lack of a single source for determining solvency. In addition to similar customers of the bank in accordance with the standards of the bank have very little income; this provision requires the implementation by credit institutions of labour costs and related organizational costs. The period of these factors deepens the instability of the economic situation increases the risk of non-repayment of funds provided by the bank.

The activity of large companies in underdeveloped systems of microfinance is successfully working in microfinance institutions and provides assistance in raising the economic level and stability of existing social contradictions.

The analysis of legislation of the CIS countries shows that one of the main shortcomings in the

existing legislations of the countries is the lack of current regulation of the legal definitions of the "micro" and "micro-services". At the same time, to date for this type of social relations was formulated the main regulatory definitions.

However, the economic and legal definitions of the act on the basis of microfinance services, and due to the presence of inherent qualities are different from other uniform services. When comparing banks with microfinance in the economic sphere distinctive characteristics are the size and number of transactions when using financial services of traditional banking institutions providing services to those sectors of the population who are faced with difficulties, and limiting the scope of service within a defined territory.

Characteristics of microfinance activities of the CIS countries are the following:

First of all, the activity of microfinance organizations is characterized by a special legal regulation on the basis of the legislation of many the CIS countries and is subject to the law on banks and banking activity. Secondly, the microfinance services are separate legal entities – credit unions, pawnshops, organizations formed to carry out this activity and have the potential of microfinance. Thirdly, the microfinance is defined by the normative restriction of the list of provided services. In microfinance, the number of savings and credit operations is limited. Fourthly – the composition of the customer base is adjustable from the point of view of quantity and quality. In Uzbekistan, including some of the CIS countries: Russia, Ukraine, Azerbaijan, Moldova, Kazakhstan microfinance organizations are created on the basis of membership (representation), whereas services is provided only their members. Fifthly – the presence of the distinguishing characteristics in the definition of the procedure for operations of microcredit organizations. In all of the countries of the CIS (countries-members of the CIS) although not clearly, from the point of view of terminology, defined the differences of legislative concepts of banking and microfinance services. Even if it's about deposits or loans there are specific legal differences inherent in microcredit organizations. For example, the contract of bank deposit, concluded between the bank and the citizen is a massive contract, but the contract of bank deposit, concluded by the credit union is not a massive contract, because the range of subjects that used these types of services, namely the members of the association, defined. In accordance with the laws of Moldova and Russia, microfinance services are based on the Regulation "On credit contracts of the civil code", that is, in contrast to banking services are characterized by independent legal regulation. Sixthly – set the maximum amount of the granted credit or a loan. If in the legislation does not define the maximum number of services provided by banks, microfinance organizations in the

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CIS countries the amount of funds is limited. In this regard, to financial services provided by these agencies, uses the term "micro". Seventhly – economic norms concerning the simplification of requirements. Unlike banks, which are strictly set by many figures due to small volume and the number of services provided by microfinance institutions, their activities are not fully defined, and regulations are not stringent and in accordance with the rules determined by several parameters. Although many countries in have stringent requirements on the activity of microfinance organizations, banks, these requirements on the requirements to banks is simple. Eighthly - the establishment of the competent authority in the field of monitoring and control. In many member countries of the CIS created a special authority for the monitoring and control over the activity of microfinance organizations. The Central Bank in these countries is not eligible for regulation and supervision of microfinance services [4].

Of course, microfinance services, as a financial activity has distinctiveness in legal settlement and this originality are manifested not only by application to type of activity the term "micro". In this case, the subject of regulatory legislation on microfinance is the social relations arising from the activities of microfinance organizations and the provision of microfinance services.

In accordance with the Article 3 of the Law of the Republic of Uzbekistan "On microfinancing" No.

50 of 15 September 2006, "Microfinancing is an activity that provides microfinance services, microcredit, microdebt, the provision of microleasing in an amount not exceeding the amount set out in Convention with the legislative documents of the microfinance institutions and other microfinance services in accordance with the agreement on provision of services [5].

It says that microfinance is a type of economic activity for the provision of microfinance services. Microfinance service is, in accordance with law, financial operations by microfinance organizations, unlike banks, have a special legal status. The main types of microfinance operations are to attract funds and issuance of loans. This list is not strictly final, depending on the type and characteristics of legal regulation of the organization may be restricted or supplemented. In law may also be included an additional legal description of microfinance services, for example, the maximum amount of debt.

Overall, the legal framework of microfinance activity today needs improvement.

On the basis of the above features is necessary to modernize the legal norms regulating the activity of microfinance organizations as well as improvement of the coherence of the legal mechanism of services provided by microcredit organizations.

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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>



**Abbas Mohsin Salman Al-Hameedawi**  
Professor,  
College of Agriculture,  
University of Kufa,  
Iraq  
[ali.alhameedawi@uokufa.edu.iq](mailto:ali.alhameedawi@uokufa.edu.iq)



**Zainab Rehman Jassim Al-Malikshah**  
Manageress,  
Agric of Wasst,  
Iraq

SECTION 23. Agriculture. Agronomy. The technique.

## EFFECT OF SPARING WITH KELPAK, HLETAB AND GROFALCS ON STORABILITY CHARACTERS OF FRUITS OF SOURS ORANGE (CITRUS AURANTIUM L.)

**Abstract:** This study was carried out in a private orchard at AL-Abbasyia, Najaf Governorate during the growing of season 2014 on the local sours orange fruit. The trees were sprayed at 1 / 10 / and 1 / 11 / 2014 with three concentrations of Kelpak and Hletab (1, 2 and 3 ) % for each other and Grofalcs at concerted (200,300 and 400 mg/L) and stored three months from 1/12 /2014 to 1/3/ 2015 in 5C0 and 80- 85 R.H . Results showed that fruit which treated with above mentioned treatments had significant effect in terms of redaction weight loss percentage, physiological decay (RS+SERB), fungi decay and total decay and increase percentage of peel, peel thickness, weigh of peel, humidity of peel, percentage of total soluble sold, acidity, vitamin C, Antioxidant capacity and rate of respiration at the end of storage period. The treatment of Grofalcs 400 mg/L gave the best results of studied characteristics.

**Key words:** storability of fruits, sours, orange, cold storage.

**Language:** English

**Citation:** Al-Hameedawi AMS, Al-Malikshah ZRJ (2016) EFFECT OF SPARING WITH KELPAK,HLETAB AND GROFALCS ON STORABILITY CHARACTERS OF FRUITS OF SOURS ORANGE (CITRUS AURANTIUM L.). ISJ Theoretical & Applied Science, 01 (33): 47-51.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-10> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.10>

### Introduction

Sours orange trees are evergreen fruits , belong to genus " Citrus " , which is follows to the Family "Rutaceae " , Citrus fruits are among the most important fruit crops in the subtropical regions . The initial citrus variety is thought to have originated in the Assam region or adjacent areas in south east Asia . The cultivation of citrus trees is widespread in those tropical and subtropical regions that have a suitable climate ( latitude 41N to 34S )( Salvatava, 2010 ) .Physiological disorders significantly influence the quality of citrus fruits in markets and postharvest factors after the occurrence of physiological disorders of fruits ( Mitra, 1997) . Abo – Zaid (2000) mentioned that , spraying of extract of alga Oligo-x which containing high percentage of salicylic acid and hormones at conc. of (1 and 2 %) on mango trees in Egypt has increased the total soluble sold (T.S.S ) , acidity and vitamin C . Basak (2008) mentioned that , spraying apple tress in the end of full bloom period with extract of alga Eckonia (Kelpak ) at conc. of ( 0.5 , 1 and 2 % )

caused a significant increased the , content of leaves from total chlorophyll , hormones , IAA , GA<sub>3</sub> , quality of fruits and its resistant to physiological and fungi decay throw storage compared to control treatment . Dell (2013 ) showed that , sea weed and extract of alga's contenting high percentage of Salicylic acid , cytokinin , Fume acid ,GA<sup>3</sup> and auxins that led to delay of senescence of fruits .Bondok, et al.(2013 ) found that spraying grape fruit trees with extract of alga's ( Acadian , Goemar and BM86 ) at conc. of ( 0.5 , 1 and 2 % ) caused increase percentage of peel, peel thickness, weigh of peel, humidity of peel and reducing percentage of total soluble sold , acidity , vitamin C in the vegetative growth and fruits quality with increase of concentration of extract of alga's . Bund and Norrie ( 2011) observed that cherry trees when applied at ( 0.5,1 and 2 ) Kg/ H seaweed increased length ,diameter of fruit ,total yield of trees , total soluble solids , total sugar , vitamin C and anthocyanine pigment in fruit compared with control treatment . AL- Rahem (2012) noticed that , spraying local tress of orange with Grofalcs at conc. ( 100 ,

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150 mg / L ) caused increase percentage of peel, peel thickness, weigh of peel, humidity of peel and reducing percentage of total soluble solid , acidity and vitamin C of fruits compared to control treatment . The main objective of this investigation is to study of the effect of spraying with Hletab , kelpak and Grofalcs on reducing percentage of weight loss and improve storability of fruits of sours orange that stored 3 months at 5C and 80-85 R.H .

### Materials and methods:

The present study was conducted out during 2014 growing season on 10 years old of the local sours orange trees grown in an orchard located at El-Abbasiya / Najaf governorate. The trees were planted at (5 x 5) m apart and received the same horticultural management. Thirty trees similar size and growth were selected and divided into 10 treatments with three replicates . It is a doped according to Randomized Complete Block Design (RCBD) , and the results were statistically analyzed according to LSD test at the probability level of 5% (Al-Rawi and Khalf Allah , 2000) . Trees spraying with kelpak ,Hletab, at percentage of (1,2 and 3)% each other and Grofalcs at conc. Of (200, 300 and 400) mg/L at 1/10/ and 1 / 11 / 2014 . Hletab, it was extract of alga Fucox that containing fucoxant pigment 70 mg/L , growth stimulator ( methyl puntosan, 20 mg/L , fucodan, 23 mg/L , mantol 15mg/L , riboflavin 30mg/L , olego scoris 90mg/L ) , IAA 20mg/L ,CKs 35mg/L , Vit.C 9mg/L , amino acid 6% , organic nitrogen 3% , phosphor 2% , potassium 3% , magnesium 2% , Iron 2% , Zinc 2% , organic matter 16% , Algonac acid 50% . Kelpak , it was natural extract of alga Eckonia that containing IAA 11mg/L ,CKs 31mg/L , amino acid 3% , organic nitrogen 2% , phosphor 3% , potassium 2% , Magnesium 2% , Iron 2% , Zinc 2% , organic matter 12% ( Oyoo et al., 2010) . Grofalcs , ( it were discs of GA3 50% from the production of Green river company. India). Hletab , kelpak and Grofalcs in ( It were from the production of Green river company. India). Spraying was done early morning until wetness was full addendum . Tween 20 was added at conc. of 1cm<sup>3</sup>/L as spreader material . The experiment involved the following 10 treatments :

- 1- Control treatment (sprayed with tap water).
- 2- Kelpak as foliar sprays at concentration of 1% .
- 3- Kelpak as foliar sprays at concentration of 2% .
- 4- Kelpak as foliar sprays at concentration of 3% .
- 5- Hletab as foliar sprays at concentration of 1% .

- 6- Hletab as foliar sprays at concentration of 2% .
- 7- Hletab as foliar sprays at concentration of 3% .
- 8- Grofalcs as foliar sprays at concentration of 200 mg / L .
- 9- Grofalcs as foliar sprays at concentration of 300 mg / L .
- 10- Grofalcs as foliar sprays at concentration of 400 mg / L .

In 1 / 12 / 2014 harvested 90 Kg fruits similar in size and color without diseases and mechanical injuries from trees of experiment . This fruits were treated with Benlate at conc. of 1 gm / L to improve from postharvest pathology . Fruits were divided into 10 treatments weight 9 Kg for each treatment. The fruits of each previous treatments were divided into 3 replicates and each part weight was 3 Kg . These parts were placed in polyethylene bags with 22 holes for each bags and the diameter of the hole were 0.5 Cm . The fruits were stored under 5C<sup>0</sup> temperature and relative humidity 80-85 % for three months starting in 1 / 12 / 2014 . The design for this treatment was similar to that of the field experiment . In 1 / 3 / 2015 fruits were taken out and traits were measured . The % weight loss , % physiological decay Stem End Rind Breakdown (SERB) , % physiological decay Rind Stem (RS) , % fungi decay (*Penicillium italicum* , *Penicillium digitatum*, *Alternaria citri* ) , % Total decay , percentage of peel , peel thickness mm , Weigh of peel gm, % humidity of peel , Acidity , . Vitamin C mg /100 ml Juice , % juice and Respiration rate mgCO<sub>2</sub>/ Kg /hr according to ( A.O.A.C , 1985 ) . The total soluble solids were determined by hand refract meter. Antioxidant capacity was determined to previous work (Crisosto and Crisosto, 2001)

1-Weight loss percentage: Data in Table ( 1 ) shows that , spraying trees of local sours orange with kelpak , Hletab and Grofalcs led to significantly decreased the percentage of weight loss after storage fruits 3 months that gave the lowest percentage 2.13% in the treatment Grofalcs 400 mg /L in comparison to the highest percentage 4.42% in the control treatment .The reason of decreasing the percentage of weight loss of fruits lead to influence these materials in some physiological changes in the fruit peel .This process leads to increase the poly amines which it used to enhance the stability of cell membranes .The poly amines are in content to nucleic acids in structure of membranes and this leads to make the peel thick and firmness and decrease the moisture loss .The result is decreasing the rate of respiration which decrease the loss in weight ( Jundi , 2003, and Spinelli, et al. 2009) .



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2-The percentage of physiological decay Stem End Rind Breakdown (SERB), Rind Stem (RS), fungi decay and Total decay .

Data in Table ( 1 ) indicate that, all treatments significantly decreased the percentage of physiological decay (SERB) , (RS) , fungi decay and Total decay compared to control treatment .The highest values in the control treatment it was ( 1.33 % , 2.39 % , 1.93% and 5.65% ) , while the lowest percentages ( 1.07 % , 1.40 % , 0.48 % and 2.95 % in the treatment Grofalcs 400 mg /L . The decrease in different type of decay in fruits as a result of kelpak , Hletab and Grofalcs led to its role in making new balance in fruits and around between O<sub>2</sub> , CO<sub>2</sub> and ethylene . The increase of water content in fruits leads to decrease the percentage of decays (Roy, 2008 ) . Abo – Zaid (2000) mentioned that , the extracts of sea alga's have salycine that protected fruits from some biological dieses are which caused by fungi and Bacteria so, the salycine had positive role in decreasing the percentage of decay .

### 3- The percentage of peel, peel thickness, Weigh of peel and percentage humidity of peel .

Results indicated in table ( 1 and 2 ) that, treating trees with kelpak , Hletab and Grofalcs led to a significant increase in the percentage of peel, peel thickness, weigh of peel and percentage humidity of peel of fruits which reached to the maximum values of ( 35.81 % , 4.00mm, 51.79 gm and 87.49 %) with the treatment of Grofalcs 400 mg/L in comparison to the lowest values (27.75 % , 2.92mm, 46.21 gm and 85.96%) in control treatment, respectively . The spraying with kelpak, Hletab and Grofalcs led to decrease the rate of fruits respiration because of its role as resistance ethylene functions . These materials change the structure of cells wall which effected the quantity of respiration and transpiration in positive direction. The fruits preserve their peels (Dell, 2013). The materials have another role in increasing the fruits cells growth and the

growth of peel and its development ( Lisa and Kader, 2003).

### 4- The chemical constant of fruits juice .

Data in Table ( 2 ) shows that, spraying kelpak , Hletab and Grofalcs led to a significant increased in the content of fruits from the percentage of total soluble sold, acidity, vitamin C, Antioxidant capacity and rate of respiration compared to control treatment at the end of storage. The highest significance result were recorded in treatment of Grofalcs 400 mg /L, that gave the highest percentage of total soluble sold, acidity, vitamin C, Antioxidant capacity and rate of respiration of fruits , they were (13.95 % , 2.83%, 49.53 mg / 100 ml Juice, 2.14 (mmol TE/g FW) and 19.98 mgCO<sub>2</sub>/ Kg /hr ) comparison with (11.73 % , 1.97% ,48.11 mg / 100 ml Juice , 1.66 (mmol TE/g FW) and 31.56 mgCO<sub>2</sub>/ Kg /hr ) in control treatment ) respectively . The increase in chemical companied of fruit juice because of fruits treated with such materials led to reducing the loss in weight , increase in firmness peel of fruits and reduction the respiration rate (Al-Shamery, 2014).

### Conclusion

It could be concluded from this experiment that the cv. local sours orange fruit which treated with concentrations of Kelpak , Hletab and Grofalcs and stored three months had significant effect in terms of redaction weigh loss percentage , physiological and fungi decay (RS+SERB) total decay and increase percentage of peel ,peel thickness, weigh of peel, humidity of peel , percentage of total soluble sold , acidity , vitamin C , Antioxidant capacity and rate of respiration. The treatment of Grofalcs 400 mg /L gave the best results of studied characteristics at the end of storage period.

**Table 1**  
**Effect of spraying with Kelpak , Hletab and Grofalcs on storability characters of fruits of sours orange (Citrus aurantium L. ) for three months .**

Treatments	% weigh loss	% physiological decay SERB	% physiological decay SR	% fungi decay	% Total Decay	% of peel	peel thickness mm
Control	4.42	1.33	2.39	1.93	5.65	27.75	2.92
Kelpak 1%	4.10	1.13	1.80	1.57	4.50	30.66	3.05
Kelpak 2%	3.25	1.09	1.61	1.17	3.87	31.00	3.62
Kelpak 3%	3.09	0.80	1.20	0.78	2.78	33.12	3.75
Hletab1%	3.90	1.15	1.65	1.53	4.33	29.90	3.11



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Hletab2%	3.55	1.13	1.45	1.46	4.06	32.28	3.32
Hletab3%	2.97	0.50	0.98	0.77	2.25	33.47	3.68
Grofalcs 200 mg / L	2.78	1.21	1.29	1.50	4.00	29.90	3.75
Grofalcs 300 mg / L	2.34	1.16	1.68	0.75	3.59	33.25	3.88
Grofalcs 400 mg / L	2.13	1.07	1.40	0.48	2.95	35.81	4.00
L . S. D. 0.05	1.13	0.30	0.11	0.22	1.10	1.60	0.08

**Table 2**

**Effect of spraying with Kelpak , Hletab and Grofalcs on storability characters of fruits of sour orange (Citrus aurantium L.) for three months.**

Treatments	Weigh of peel gm	% humidity of peel	% Total soluble sold	% Acidity	Vitamin C mg / 100 ml Juice	Antioxidant capacity (mmol TE/g FW)	Respiration rate mgCO <sub>2</sub> / Kg /hr
Control	46.21	85.96	11.73	1.97	48.11	1.66	31.56
Kelpak 1%	47.54	86.78	12.78	2.01	48.48	1.99	27.32
Kelpak 2%	47.98	86.96	12.22	2.19	48.59	2.13	27.00
Kelpak 3%	48.76	87.23	12.76	2.28	49.00	2.25	26.16
Hletab1%	47.18	86.49	13.71	2.46	48.42	2.19	26.78
Hletab2%	48.85	86.74	13.60	2.59	48.90	2.20	25.46
Hletab3%	49.67	86.95	13.82	2.71	49.18	2.12	23.45
Grofalcs 200 mg / L	48.50	86.87	13.50	2.68	49.08	2.28	25.49
Grofalcs 300 mg / L	50.28	87.20	13.73	2.78	49.29	2.35	22.85
Grofalcs 400 mg / L	51.79	87.49	13.95	2.83	49.53	2.41	19.98
L . S. D. 0.05	0.83	0.96	0.18	0.04	0.21	0.18	0.28

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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

### SECTION 7. Mechanics and machine construction.



**Denis Alexandrovich Chemezov**  
Master of Engineering and Technology,  
Corresponding member of  
International Academy of Theoretical and  
Applied Sciences,  
Lecturer of Vladimir Industrial College,  
Russian Federation  
[chemezov-da@yandex.ru](mailto:chemezov-da@yandex.ru)



**Vasily Sergeevich Seliverstov**  
Student of  
Vladimir Industrial College,  
Russian Federation  
[seliverstov-vasily2015@yandex.ru](mailto:seliverstov-vasily2015@yandex.ru)



**Anzhelika Vladimirovna Bayakina**  
Lecturer of  
Vladimir Industrial College,  
Russian Federation  
[bajakina.anzhelika@yandex.ru](mailto:bajakina.anzhelika@yandex.ru)



**Natalia Andreevna Zezina**  
Student of  
Vladimir Industrial College,  
Russian Federation  
[natalia162743@gmail.com](mailto:natalia162743@gmail.com)

## THE INFLUENCE OF THE MAGNITUDE OF THE RADIUS CHAMFER IN THE DIE HOLE ON THE DEGREE OF DEFORMATION OF THE PROCESSED MATERIAL AND THE PRODUCTIVITY OF THE DEEP DRAWING PROCESS OF THE PLATE STOCK

**Abstract:** The article gives recommendations on optimization of deep drawing of the plate stock based on the obtained dependencies productivity treatment and the degree of deformation of the material from the magnitude of the radius chamfer in the die hole.

**Key words:** a deep drawing, a plate stock, a radius chamfer, a deformation, a die, a productivity.

**Language:** Russian

**Citation:** Chemezov DA, Seliverstov VS, Bayakina AV, Zezina NA (2016) THE INFLUENCE OF THE MAGNITUDE OF THE RADIUS CHAMFER IN THE DIE HOLE ON THE DEGREE OF DEFORMATION OF THE PROCESSED MATERIAL AND THE PRODUCTIVITY OF THE DEEP DRAWING PROCESS OF THE PLATE STOCK. ISJ Theoretical & Applied Science, 01 (33): 52-57.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-11> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.11>

УДК 621.7.043

### ВЛИЯНИЕ ВЕЛИЧИНЫ РАДИУСНОЙ ФАСКИ В ОТВЕРСТИИ МАТРИЦЫ НА СТЕПЕНЬ ДЕФОРМАЦИИ ОБРАБАТЫВАЕМОГО МАТЕРИАЛА И ПРОИЗВОДИТЕЛЬНОСТЬ ПРОЦЕССА ГЛУБОКОЙ ВЫТЯЖКИ ЛИСТОВОЙ ЗАГОТОВКИ

**Аннотация:** В статье даны рекомендации по оптимизации процесса глубокой вытяжки листовой заготовки на основании полученных зависимостей производительности обработки и степени деформации материала от величины радиусной фаски в отверстии вытяжной матрицы.

**Ключевые слова:** глубокая вытяжка, листовая заготовка, радиусная фаска, деформация, матрица, производительность.

При невысокой точности размеров и геометрической формы детали обработка

давлением пластических материалов занимает лидирующее место в мало- и безотходном

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производства. Для получения тонкостенных полых деталей типа «стакан», «крышка», «корпус» и др. применяется листовая штамповка и, в частности, формообразующая операция – вытяжка. Образование контура детали происходит при вдавливании листовой заготовки в рабочие поверхности формообразующих инструментов (пуансон и вытяжная матрица). За счет пластической деформации обрабатываемый материал принимает форму этих поверхностей.

В работах [1, 2] определено, что при толщине листовой заготовки более 2.5 мм процесс гофрообразования не происходит, т. е. вытяжку материала можно производить без дополнительных прижимных устройств. Заготовки толщиной до 2 мм [3] обладают малой жесткостью, и для выполнения процесса глубокой вытяжки детали необходимо применять складкодержатель.

Рассмотрим следующие вопросы, касающиеся оптимизации технологического процесса глубокой вытяжки полых деталей, которые имеют форму тел вращения.

Первый вопрос. Влияние степени напряженно-деформированного состояния обрабатываемого давлением материала на качество готовой детали.

Наибольшая деформация материала листовой заготовки происходит в зоне перехода плоской поверхности в рабочее цилиндрическое отверстие вытяжной матрицы [4, 5]. Дальнейшее продавливание заготовки пуансоном приводит к утончению боковых стенок и дна детали [6] и образованию в местах изгибов трещин, которые могут привести к частичному разрушению материала. Исследование интенсивности деформации материала в условиях изменения величины радиусных фасок в отверстии матрицы позволит определить оптимальный размер конструктивного элемента формообразующего инструмента, при котором в готовой детали возникают минимальные остаточные напряжения [7].

Второй вопрос. Повышение производительности технологического процесса вытяжки.

Повышение производительности достигается путем увеличения скорости пуансона. При этом увеличивается скорость деформации материала заготовки, а, значит, и сопротивление деформации [8]. Это требует повышения усилия, которое действует на пуансон штампа. Можно сократить основное время на обработку детали путем подбора рациональной геометрии формообразующих инструментов без

изменения технологических режимов пластического деформирования заготовки.

Исследования влияния величины радиусной фаски в отверстии матрицы на степень деформации обрабатываемого материала и производительность процесса глубокой вытяжки листовой заготовки осуществлялись в многоцелевой компьютерной программе конечноэлементного анализа LS-DYNA.

Были выполнены 20 экспериментов, в которых режимы обработки не изменялись на всем временном диапазоне процесса глубокой вытяжки полых детали. Имитационное моделирование динамики процесса глубокой вытяжки производилось в трехмерной постановке.

Процессу вытяжки в холодном состоянии подвергали листовые заготовки, изготовленные из деформируемого алюминиевого сплава марки Д16, наружным диаметром 100 мм и толщиной 2 мм.

Складкодержатель представлял собой плиту с габаритными размерами 100×100×5 мм и центральным цилиндрическим отверстием диаметром 60 мм. Складкодержатель прижимался к фланцу листовой заготовки с силой 10 кН.

Пуансон изготавливался наружным диаметром 56 мм и общей длиной 120 мм. На торцевой кромке рабочей (давящей) части пуансона выполнялась радиусная фаска величиной 3 мм. На не рабочую торцевую поверхность пуансона действовало постоянное усилие величиной 40 кН.

Габаритные размеры вытяжной матрицы составляли 120×120×40 мм. Сквозное цилиндрическое формообразующее отверстие вытяжной матрицы принималось величиной 70 мм. Таким образом, зазор между контактными поверхностями пуансона и рабочего отверстия вытяжной матрицы составил 7 мм. Размер радиусной фаски в рабочем отверстии вытяжной матрицы изменялся в диапазоне от 0.5 до 10.0 мм включительно с шагом 0.5 мм.

Складкодержатель, пуансон и вытяжная матрица по условию задачи принимались абсолютно твердыми телами.

Степень пластической деформации материала при различных величинах радиусной фаски в рабочем отверстии вытяжной матрицы представлена цветовыми контурами на моделях обрабатываемых заготовок (рис. 1).

Модель пуансона на эпюрах не изображалась. Цветовая шкала, справа от эпюр, определяет величину пластической деформации материала.

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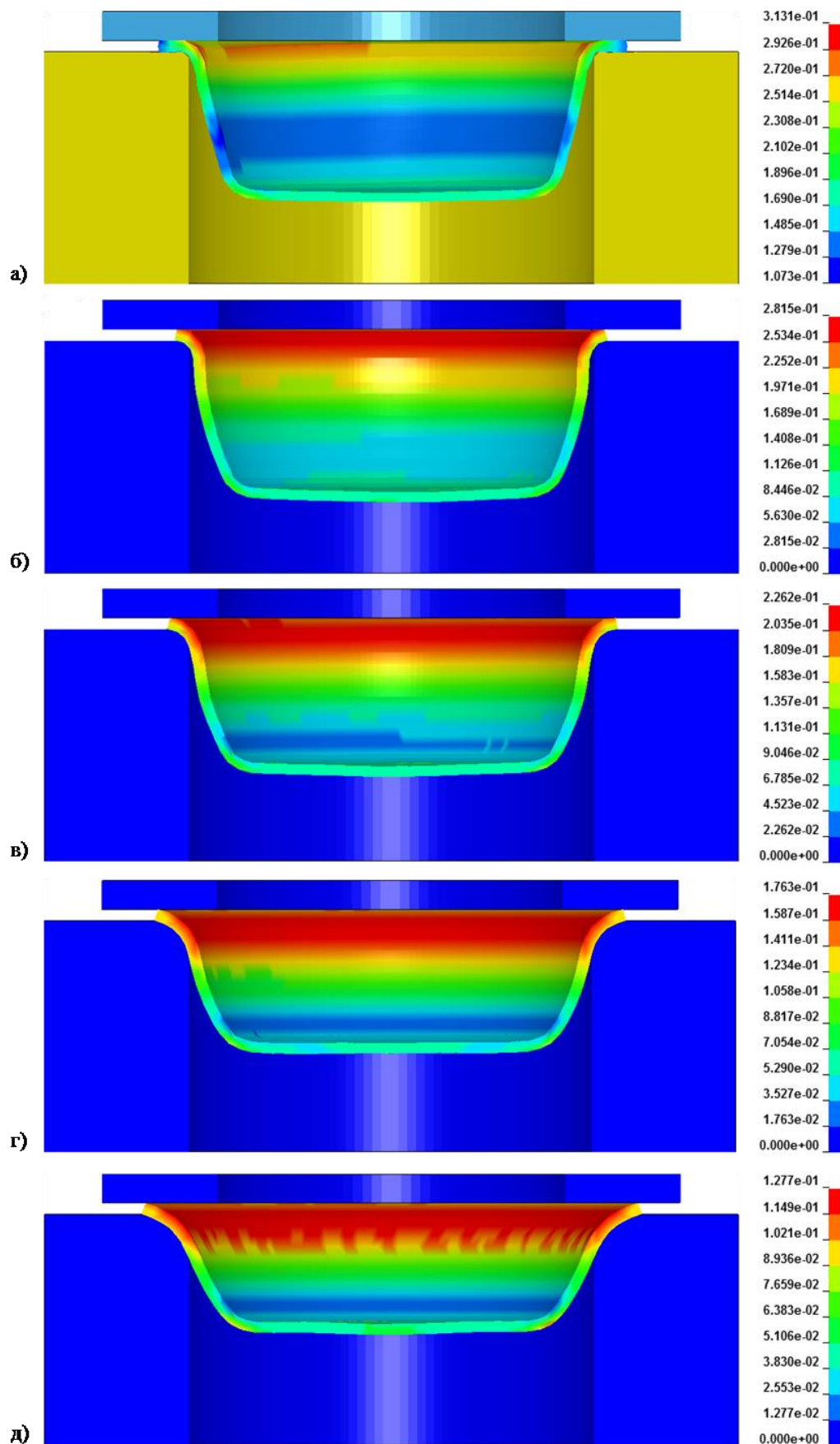


Рисунок 1 – Степень пластической деформации материала при изменении величины  $r$  в отверстии вытяжной матрицы: а –  $r = 1.0$  мм; б –  $r = 2.0$  мм; в –  $r = 4.0$  мм; г –  $r = 7.0$  мм; д –  $r = 10.0$  мм.



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Во всех случаях наибольшей пластической деформации подвергается верхняя часть вытягиваемой детали, наименьшей – нижняя часть.

При глубине вытяжки заготовки 25 мм (рис. 1, а) толщина стенки в области радиусных фасок на рабочей части пуансона и в отверстии вытяжной матрицы утончается. Материал дальше не продавливается в отверстие вытяжной матрицы. Последующее движение пуансона вызовет разрыв металла в указанных местах. Максимальная величина пластической деформации составляет 0.313.

С увеличением величины радиусной фаски в отверстии вытяжной матрицы (рис. 1, б – г) площадь деформации увеличивается, а значение коэффициента уменьшается до 0.176. Материал продавливается в рабочее отверстие вытяжной матрицы до формирования контура пустотелой детали.

При максимальном выбранном значении радиусной фаски (рис. 1, д) происходит снижение пластической деформации материала до 0.127 (коэффициент меньше в 2.5 раза по сравнению с

коэффициентом, полученным при  $r = 1.0$  мм). Однако в условии увеличения площади контакта материала с поверхностью формообразующего инструмента это приводит к образованию складок (гофр) [9].

Моделирование процесса глубокой вытяжки листовой заготовки с изменением величины радиусной фаски в отверстии матрицы показало:

1) при  $r \leq 0.5s$  вытяжка материала происходит не полностью со значительным утончением стенки, где  $s$  – толщина листовой заготовки до обработки давлением, мм;

2) при  $r = 0.75s$  вытяжка материала происходит полностью, однако контур детали получается несимметричным (не соответствует техническим требованиям на изготовление продукции);

3) при  $r \geq s$  вытяжка материала происходит полностью без отклонений от технических требований на изготовление детали.

На рис. 2 представлен общий вид модели готовой пустотелой детали после глубокой вытяжки.

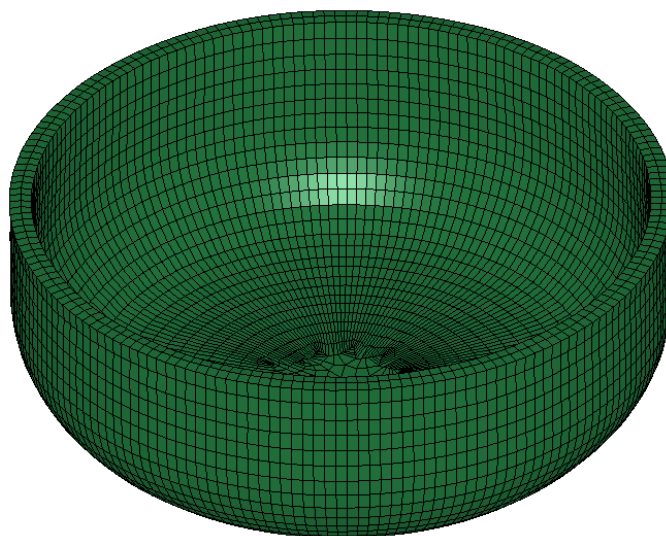


Рисунок 2 – Геометрическая форма полый детали после вытяжки.

Расчетная высота детали после вытяжки составляет 26 мм, радиус изгиба – 14 мм.

Значения времени процесса вытяжки детали  $\tau$  в процентном выражении при различных величинах радиусной фаски в отверстии вытяжной матрицы представлены в табл. 1.

Прочерки в таблице означают, что значения времени обработки детали для данного диапазона величин радиусной фаски не определялись (производственные дефекты). За 100% принято лимитирующее время обработки детали.

Таблица 1

Время вытяжки детали в процентном выражении.

$r$ , мм	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
$\tau$ , %	–	–	–	100	98.3	93.6	93.6	88.7	90.3	90.3
$r$ , мм	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0
$\tau$ , %	89.5	88.7	88.7	88.7	87.1	87.1	87.1	87.1	88.7	90.3

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 ESJI (KZ) = 1.042  
 SJIF (Morocco) = 2.031

ICV (Poland) = 6.630  
 PIF (India) = 1.940

Зависимости работы деформирования заготовки при вытяжке от времени процесса, экономии времени обработки детали и изменения значения коэффициента пластической

деформации материала от величины радиусной фаски в отверстии матрицы представлены на рис. 3, а – в.

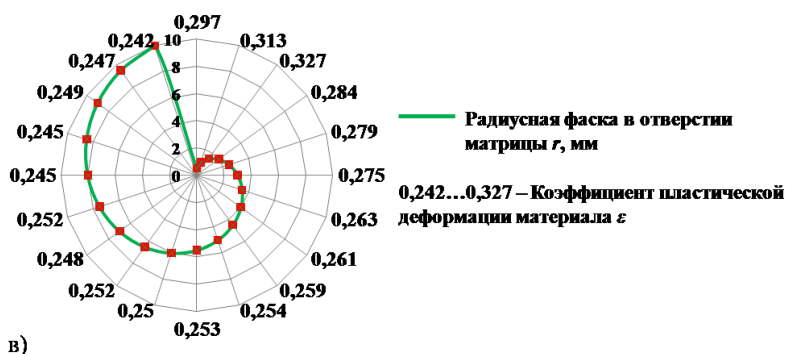


Рисунок 3 – Анализ результатов расчета, представленный в графическом виде: а – зависимости работы деформирования заготовки при вытяжке (на графике 1 – для  $r0.5$  мм, 2 – для  $r10$  мм) от времени процесса; б – зависимости экономии времени обработки детали от величины радиусной фаски в отверстии матрицы; в – изменение значения коэффициента пластической деформации материала от величины радиусной фаски в отверстии матрицы.

На основании проведенного исследования процесса глубокой вытяжки можно сделать следующие выводы:

1. Затраты энергии на работу деформирования листовой заготовки зависит от величины радиуса фаски – чем больше радиус, тем больше потребляется мощность технологического оборудования.
2. Определен оптимальный диапазон величин радиусных фасок, позволяющий экономить время обработки детали. В случае заготовки толщиной 2 мм этот диапазон

составляет от 7.5 до 9.0 мм, при этом экономия времени обработки достигает 13%.

3. Величины радиусных фасок (8.0; 8.5), при которых коэффициент  $\epsilon$  (0.245) – показатель наименьшей пластической деформации материала детали, влияющий на степень остаточных напряжений после вытяжки.

Полученные результаты исследования позволяют рекомендовать в производство наиболее рациональную геометрию вытяжной матрицы, обеспечивающую максимальную производительность вытяжки деталей без изменения режимов обработки.

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<b>JIF</b> = <b>1.500</b>	<b>SJIF (Morocco)</b> = <b>2.031</b>	

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**SECTION 20. Medicine.****CLINICAL-PSYCHOLOGICAL AND PATHOCHEMICAL  
MECHANISMS OF THE OPIOID ADDICTION OF PERSONS WITH  
COMORBID PATHOLOGY**

**Abstract:** Investigated the influence of comorbid pathology at the clinical and psychosocial disorders in opioid addiction, studied the intensity of systemic oxidative stress of patients, depending on the duration of disease.

**Key words:** opioid addiction, psychological status, oxidative stress.

**Language:** Russian

**Citation:** Abdullaeva VK (2016) CLINICAL-PSYCHOLOGICAL AND PATHOCHEMICAL MECHANISMS OF THE OPIOID ADDICTION OF PERSONS WITH COMORBID PATHOLOGY. ISJ Theoretical & Applied Science, 01 (33): 58-63.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-12> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.12>

**КЛИНИКО-ПСИХОЛОГИЧЕСКИЕ И ПАТОХИМИЧЕСКИЕ МЕХАНИЗМЫ СИНДРОМА  
ЗАВИСИМОСТИ ОТ ОПИОИДОВ У ЛИЦ С КОМОРБИДНОЙ ПАТОЛОГИЕЙ**

**Аннотация:** Исследовано влияние коморбидной патологии на клинические и социально-психологические нарушения при зависимости от опиоидов, изучена интенсивность системного окислительного стресса у больных в зависимости от длительности наркотизации.

**Ключевые слова:** зависимость от опиоидов, психологический статус, окислительный стресс.

Проблема наркомании является в настоящее время «одной из острейших глобальных проблем, представляющих собой угрозу здоровью населения, экономике, социальной сфере, правопорядку во многих странах мира» [9, с.115]. Вопросы клиники и течения синдрома зависимости от опиоидов до настоящего времени остаются актуальными, малоизученными и вызывающими научно-исследовательский интерес. Огромное разнообразие и изменчивость клинических проявлений при наркоманиях заставляет врачей в своей повседневной практике сталкиваться с необходимостью решения все более сложных диагностических и лечебных задач [10, с.98]. Вместе с этим, закономерным является и вопрос о стержневом синдроме заболевания - патологическом влечении к наркотику, которое занимает место симптомов «первого ранга», патогномичного признака [1, с.11]. Медико-социальная реабилитация больных с зависимостью от опиоидов является одним из приоритетных направлений наркологии [3, с.38]. Именно на этапах медико-социальной

реабилитации достигается восстановление физического, психического и духовного здоровья наркологических больных, их личностного и социального статуса, а длительные ремиссии наркологического заболевания формируются, прежде всего, благодаря соблюдению адекватных принципов построения лечебно-реабилитационных программ. Целями лечения являются соблюдение отказа от приема психоактивного вещества, к которому сформировалась зависимость; уменьшение тяжести симптомов заболевания, улучшение общего состояния здоровья и социального функционирования, исключение или снижение риска развития рецидива [7, с.212].

Выявлены неблагоприятные факторы, которые определяют быстроту формирования медицинских и социальных последствий наркоманий. В исследованиях определено значение наследственной предрасположенности к зависимости от психоактивных веществ, клинико-биологических предикторов, социальных, в том числе влияния родительской

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семьи [11, с.182; 14, с.8]. Преморбидные личностные особенности в формировании и развитии зависимости от психоактивных веществ по данным некоторых авторов встречаются в 86% случаев [1, с.12]. Личностные расстройства у больных наркоманией установлены от 28% до 65-90% случаев [12, с.1312].

Основные формы соматических осложнений у лиц, употребляющих наркотики, включают гепатотоксический, кардиотоксический, энцефалотоксический, нефротоксический и смешанные типы органопатологии, из них поражения гепатобилиарной системы (гепатит токсического или инфекционно-токсического генеза) развивается в 73,6% случаев [11, с.180; 14 с.10]. Печень является главным органом-мишенью у больных наркоманией из-за непосредственно токсического влияния героина, инфицирования вирусами гепатитов В, С или их сочетания, а также дополнительного влияния алкоголизма, нарушений питания, действия токсических примесей, содержащихся в наркотиках кустарного производства [13, с.438; 15, с.402].

Несмотря на значительное количество работ, посвященных роли клинико-психопатологических и личностных расстройств, соматической отягощенности в генезе заболевания, вопрос взаимосвязи и прогностического значения клинико-динамических и патохимических особенностей зависимости от опиоидов еще недостаточно изучен.

**Целью исследования** явилось изучение клинико-психологических и патохимических особенностей героиновой наркомании у лиц с коморбидной патологией.

**Материал и методы исследования.** В исследование было включено 324 больных мужского пола в возрасте от 18 до 55 лет, имеющих клинически очерченную зависимость от наркотиков опиоидной группы (МКБ 10- F11.2). Для проведения анализа значимости клинико-динамических факторов в развитии зависимости от опиоидов обследованные больные разделены нами на 2 группы. Основная исследуемая группа больных, зависимых от опиоидов, в сочетании с соматическими расстройствами, составила 173 человека. Группа сравнения n=151 представлена больными с зависимостью от опиоидов без соматического заболевания. Группа больных с коморбидной патологией отбиралась по принципу максимального представительства в общей исследуемой группе зависимых от опиоидов. Данные по основным соматическим расстройствам в основной группе исследования: наличие вирусных гепатитов В и С. Диагноз гепатита В и С выставлялся после индикации соответствующих серологических маркеров в

лаборатории. Основными методами исследования были клинико-психопатологический, клиническая беседа, интервьюирование и анкетирование, а также стандартизированные психологические методики: шкала патологического влечения к наркотику [3, с.40], сокращенный многофакторный опросник для исследования личности (СМОЛ), методика определения уровня субъективного контроля (УСК) Дж. Роттера (адаптация Е.Ф.Бажина, 1998). Для определения интенсивности процессов перекисного окисления липидов (ПОЛ) было проведено определение уровня малонового диальдегида (МДА) в сыворотке крови [6, с.67], активности каталазы в крови [5, с.82], определение среднемолекулярных пептидов (СМП) [4, с.20].

**Результаты исследования и их обсуждение.** В ходе исследования выявлено, что наиболее раннее начало эпизодического употребления психоактивных веществ (13-14 лет) отмечено в основной группе (40,8%), что достоверно отличается от группы сравнения (19,8%) ( $p<0,05$ ). Нами осуществлен сравнительный анализ особенностей структуры патологического влечения к наркотику у больных основной группы и группы сравнения. Патологическое влечение к наркотику, представленное идеаторным компонентом, в основной группе имело место в 100% случаев, что превышало аналогичный показатель группы сравнения (91,4%,  $p<0,05$ ). При этом весьма значительное превышение определялось и по аффективным расстройствам (85,9% и 77,2%) и соматовегетативному компоненту (79,9% и 54,9% основной группы и группы сравнения соответственно). Распределение частоты патологического влечения к наркотику показало превышение доли случаев со средней степенью тяжести влечения в основной группе и группе сравнения – 60,9% и 87,7% соответственно. Необходимо отметить, что в основной группе больных патологическое влечение к наркотику тяжелой степени выраженности было достоверно выше, чем в группе сравнения (36,9% против 8,6%,  $p<0,005$ ). Значимые различия между рассматриваемыми группами фиксируются по тяжести синдрома патологического влечения, максимально представленного в основной группе. Таким образом, клинико-динамические механизмы патологического влечения при героиновой наркомании являются причинным фактором развивающихся нарушений адаптации. Фактор коморбидности оказывает неоднозначное влияние на степень выраженности основных симптомов патологического влечения к наркотику, что связано с биологической и стрессогенной патофизиологической спецификой анализируемых видов коморбидной патологии.





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Изменение формы опьянения – последний во времени симптом из входящих в синдром измененной реактивности и развивается на фоне уже существующих наркоманических синдромов [7,27]. В основной группе типичная форма наркотического опьянения с преобладанием эйфории представлена сравнительно реже (11,4%). Также сравнительно более редко представлена форма наркотического опьянения с преобладанием апатии (7,6%) и замкнутости (7,6%). И сравнительно более часто - измененные формы наркотического опьянения с преобладанием тоски (25,5%), плаксивости (15,2%), дисфорических расстройств настроения (17,4%), а также - суицидальных тенденций демонстративного характера (7,6%). В группе сравнения отмечалось существенное преобладание измененных форм наркотического опьянения с эйфорией (25,9%), апатией (13,6%) и тоской (19,8%). Полученные результаты свидетельствуют, что анализируемые виды коморбидной патологии изменяют форму наркотического опьянения по типу дополнительной экзогенно-органической вредности, а также - по типу дополнительной психотравмирующего фактора.

В результате анализа профилей СМОЛ зависимые от опиоидов с коморбидной патологией проявляли высокий уровень аутичности, эмоциональной напряженности и астенизации в сочетании с существенно большей импульсивностью и чертами несдержанности, ухудшающие социальную адаптацию. Выявлены общие личностные особенности: смешанный тип реагирования с выраженными чертами шизоидности, снижением эмоционального фона, уровня побуждений и общительности, обособленно личностная позиция, склонность к раздумьям превалирующей над чувствами и деятельной активностью. Больные группы сравнения в большей степени склонны к проявлениям стеничности, протестным явлениям, нонконформизму, импульсивности. Анализ результатов УСК показал, что в основной группе отмечается низкий уровень субъективного контроля в областях общей интернальности, интернальности неудач и производственных отношений, в группе сравнения – средний уровень субъективного контроля в областях общей интернальности, интернальности неудач и производственных отношений. Зависимым от опиоидов основной группы характерны черты экстернальности. Употребление наркотика сформировало у этих больных чувство беспомощности, потребность в заботе, опеке

окружающих. Особую значимость приобретают необходимость оберегания своей социальной позиции. Зависимые от опиоидов ранимы, чувствительны, зависимы от мнения других, с низкой адаптивностью и страхом перед трудностями. Имеет место мотивация избегания неудачи при достаточно ригидных установках. Их дезадаптация может быть связана со стрессовыми ситуациями и отражать проявления временной адаптивной реакции. Она может свидетельствовать о неустойчивой личностной интеграции и отражать патологические изменения личности. Группе сравнения характерны средние значения УСК, что в жизненных ситуациях может проявляться сравнительной удовлетворенностью качеством своей жизни. Адаптация больных к новым условиям средняя. Отсутствует тенденция к доминированию. В личностно значимых ситуациях возможно принятие этими личностями ответственности на себя, но при появлении фрустрирующей ситуации возможен уход от решения проблем. В целом, они руководствуются внутренними побуждениями, проявляя интернальность или экстернальность в зависимости от ситуации. Все эти варианты объединяет определенный тип дезадаптации, индивидуально-личностный стиль переживаний и определенные методы защиты. Таким образом, совокупность психологических показателей и наличие коморбидной патологии определяет зависимость между соматическим расстройством и уровнем субъективного контроля.

В ходе проведенного исследования нами изучена интенсивность системного окислительного стресса у больных с зависимостью от опиоидов. Анализ полученных данных позволил установить, что интенсивность генерации активных форм кислорода (АФК) в крови у обследованных пациентов изменяется в широких пределах и возрастает с увеличением длительности наркотизации, присоединения поражения печени в виде токсико-инфекционного гепатита. Так, у больных с зависимостью от опиоидов без соматической этиологии имеется умеренно выраженная эндотоксемия (увеличение СМП в 3 раза) и окислительный стресс (увеличение МДА в 2,6 раза) на фоне снижения активности каталазы в 1,5 раза по сравнению с контролем, тогда как у больных с зависимостью от опиоидов с коморбидной патологией снижение активности каталазы наблюдалось в 3,5 раза, а уровень МДА и СМП превышали контроль в 5,0 и 5,5 раза соответственно (табл.1).

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Таблица 1

**Интенсивность генерации активных форм кислорода в крови обследованных пациентов.**

Группа больных	МДА нмоль /мг белка*мин	СМП Е/мг белка	Каталаза, ммоль H <sub>2</sub> O <sub>2</sub> / млн. эрит *мин
Контрольная группа	0,51±0,09	0,021±0,001	40,1±1,7
Основная группа	1,31±0,10*	0,063±0,009*	26,9±1,1*
Группа сравнения	2,61±0,13* **	0,109±0,012* **	11,6 ±0,9* **

Примечание. \* - достоверно по отношению к контролю,  $P < 0,05$ ; \*\* достоверно относительно длительности наркотизации до 1 года.

Таким образом, при хронической интоксикации опиатами развивается системный окислительный стресс с активным вовлечением печени. Полученные нами результаты свидетельствуют о влиянии на уровень окислительного стресса в крови при опиоидной наркомании длительности наркотизации и сопутствующего ей поражения печени. Поражение печени скудно проявляется клинически, однако о функциональном поражении гепатоцитов свидетельствует системный окислительный стресс, который развивается при истощении антиоксидантной мощности организма и депо антиоксидантов в печени.

Обсуждая полученные данные, отметим, что липопероксидация и окислительная деградация белков под действием АФК вносит вклад в функционирование опиоидных рецепторов и реализацию эффекта опиоидов. Как показали наши наблюдения, окислительный стресс в крови сопровождается эндогенной интоксикацией, т.к. взаимодействие АФК с молекулами белковой и липидной природы приводит к образованию низкомолекулярных продуктов ( $M_r < 5000$  Да), обладающих токсическим действием – СМП.

Одним из важнейших неблагоприятных негативных последствий хронической наркотизации опиатами является физическая зависимость, проявляющаяся специфическими поведенческими нарушениями, и как ее следствие – развитие абстинентного синдрома. На течение абстинентного синдрома существенно влияют характерные для опиоидной наркомании соматические расстройства – гепатотоксичность и иммунодефицит.

Так, согласно нашим данным, в период воздержания от наркотиков у больных опиоидной наркоманией были выявлены аффективные, идеаторные, поведенческие и вегетативные

компоненты патологического влечения, актуализация которых отличалась вариабельностью, пароксизмальностью или волнообразностью, а характер был прямо противоположен действию опиоидных наркотиков. Отметим, что психопатологические компоненты опережали соматовегетативные проявления. У лиц с постабстинентным состоянием, длившемся более 3 недель, параметр окислительного стресса – уровень МДА был достоверно выше ( $p < 0,05$ ), чем у лиц с продолжительностью абстинентного синдрома менее 3 недель, составив  $2,20 \pm 0,49$  и  $1,4 \pm 0,18$  нмоль/мг белка\*мин соответственно.

Таким образом, особенностью биохимических нарушений гомеостаза у больных с зависимостью от опиоидов является развитие усиления генерации АФК в крови, следствием чего является развитие эндотоксемии в виду накопления продуктов деградации макромолекул белковой и липидной природы. Вероятно, столь разительное увеличение изученных параметров явилось следствием недостаточности защитной системы, включающей как ферменты с антипероксидным и антирадикальным механизмом действия, так и резерв жирно- и водорастворимых биоантиоксидантов в печени [11,15]. Эндогенная интоксикация и окислительный стресс связаны и с поражением печени, они влияют на течение абстинентного синдрома, т.к. у больных с высоким уровнем МДА и СМП абстиненция протекала дольше и тяжелее.

Необходимо отметить, что наши результаты исследования состояния антиоксидантной системы у больных с зависимостью от опиоидов свидетельствуют об угнетении ферментативного звена антиоксидантной защиты и необходимости включения препаратов, обладающих антиоксидантными свойствами при лечении данной категории больных. Купирование

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окислительного стресса необходимо для нормализации мембрано-деструктивных процессов в организме, в первую очередь, в мозге и печени, что обеспечит адекватность (а не извращенность) метаболизма в микросомальной окислительной системе препаратов, используемых в лечении – антидепрессантов, нейролептиков и др., оптимизирует постнаркотическую детоксикацию, что позволит укоротить течение абстинентного синдрома и снизить его тяжесть.

### Выводы.

1. Наличие коморбидной патологии способствует развитию средней степени и тяжелых форм патологического влечения к наркотику ( $p < 0,05$ ), изменяет характер наркотического опьянения с преобладанием тоски (25,5%) и дисфорических расстройств (17,4%), а также суицидальных тенденций демонстративного характера (7,6%).

2. Совокупность клинико-психологических показателей и наличие коморбидной патологии определяет зависимость между соматическим расстройством, личностным профилем и уровнем

субъективного контроля у зависимых от опиоидов. Зависимые от опиоидов с коморбидной соматической патологией по сравнению с группой больных без коморбидной патологии обнаруживают низкий уровень субъективного контроля, высокий уровень аутичности, эмоциональной напряженности в сочетании с большей импульсивностью и чертами несдержанности, ухудшающие социальную адаптацию.

3. Интенсивность генерации активных форм кислорода в крови у зависимых от опиоидов изменяется в широких пределах и возрастает с увеличением длительности наркотизации и сопутствующим поражением печени, проявляясь увеличением малонового диальдегида, среднемолекулярных пептидов и угнетением активности каталазы в 5,0; 5,5 и 3,5 раза относительно контроля соответственно ( $p < 0,05$ ), что диктует необходимость включения препаратов, обладающих антиоксидантными свойствами при лечении данной категории больных.

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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

### Igor Viktorovich Goloperov

Candidate of chemical sciences, Docent,  
Department of Chemical and Food Technology,  
Ukrainian Engineering and Pedagogical Academy,  
Ukraine  
[goloperov\\_igor\\_viktorovich@ukr.net](mailto:goloperov_igor_viktorovich@ukr.net)

### Elena Aleksandrovna Belova

Candidate of chemical sciences, Docent,  
Department of Chemical and Food Technology,  
Ukrainian Engineering and Pedagogical Academy,  
Ukraine  
[belovaalena@meta.ua](mailto:belovaalena@meta.ua)

### Aleksandr Nikolaevich Baklanov

Doctor of chemical sciences, Professor,  
Head of the Department of Occupational Health and  
Environmental Safety,  
Ukrainian Engineering and Pedagogical Academy,  
Ukraine  
[baklanov227@mail.ru](mailto:baklanov227@mail.ru)

## SECTION 9. Chemistry and chemical technology.

## ULTRASOUND IN THE DETERMINATION CESIUM AND CESIUM-137 IN HIGHLY WATERS, BRINE AND SALT

**Abstract:** Studied the use of ultrasound in the determination of cesium in the highly mineralized waters, brines and salt: to convert the compounds of cesium in coprecipitated form and to intensify concentration in the coprecipitation of cupric ferrocyanide. Experimentally determine the factors intensifying exposure to ultrasound. Developed an express method of determination of cesium and cesium - 137. The detection limit of cesium -  $2 \cdot 10^{-8}$ %, cesium-137 -  $1 \cdot 10^{-13}$  Ku/kg.

**Key words:** ultrasound, brines, cesium-137, coprecipitation, hexacyanoferrates divalent valence copper.

**Language:** Russian

**Citation:** Goloperov IV, Belova EA, Baklanov AN (2016) ULTRASOUND IN THE DETERMINATION CESIUM AND CESIUM-137 IN HIGHLY WATERS, BRINE AND SALT. ISJ Theoretical & Applied Science, 01 (33): 64-68.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-13> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.13>

## УЛЬТРАЗВУК В ОПРЕДЕЛЕНИИ ЦЕЗИЯ И ЦЕЗИЯ-137 В ВЫСОКОМИНЕРАЛИЗОВАННЫХ ВОДАХ, РАССОЛАХ И ПОВАРЕННОЙ СОЛИ

**Аннотация:** Изучено применение ультразвука при определении цезия в высокоминерализованных водах, рассолах и поваренной соли: для перевода соединений цезия в соосаждаемые формы и для интенсификации концентрирования соосаждением на гексацианоферрате двухвалентной меди. Экспериментально установлены определяющие факторы интенсифицирующего воздействия ультразвука. Разработана экспрессная методика определения цезия и цезия - 137. Предел обнаружения цезия -  $2 \cdot 10^{-8}$ %, цезия-137 -  $1 \cdot 10^{-13}$  Ку/кг.

**Ключевые слова:** ультразвук, рассол, цезий-137, гексацианоферрат двухвалентной меди.

**Введение.** Прямое определение цезия и цезия-137 в водах, рассолах и поваренной соли с использованием даже таких высокочувствительных методов анализа как пламенная атомно-абсорбционная спектрометрия и бета-спектрометрия не представляется возможным ввиду их незначительного содержания в анализируемых объектах [1, 2].

Применение гамма-спектрометрии, обладающей экспрессностью и достаточной

чувствительностью ( $10^{-10}$  Ку/кг), для определения цезия-137 ограничено высокой стоимостью аппаратуры и большой погрешностью анализа (более 50%), в то время как при использовании радиохимического метода погрешность определения составляет всего лишь 10% [1, 2].

В связи с чем, применяют предварительно е концентрирование, в качестве которого наиболее целесообразно использование сорбции или соосаждения [3, 4].





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Применение сорбции на синтетических ионитах требует значительного количества ионитов 7-10 г на 1 дм<sup>3</sup>, что вызывает необходимость во избежание самопоглощения и саморассеяния бета-излучения при определении цезия-137, использовать дополнительное выделение цезия-137 на носителе -двойной соли иодидов сурьмы и цезия, что значительно усложняет анализ и делает невозможным определение валового цезия [5, 6].

На концентрирование цезия соосаждением на неорганических коллекторах, в частности карбонате кальция и сульфате бария мешающее влияние оказывает хлорид натрия в концентрации свыше 30 г/дм<sup>3</sup> [4].

Концентрирование соосаждением на гетерополисоединениях, например, на фосфорномолибденовой кислоте или вольфрамофосфате аммония требует значительных количеств коллектора, более 10

ммоль/дм<sup>3</sup> и кроме, того на степень соосаждения мешающее влияние оказывают ионы натрия в концентрации более 0,1 моль/дм<sup>3</sup>. Процесс отделения осадков солей гетерополисоединений усложнен вследствие того, что частицы сорбента крайне плохо отстаиваются и фильтруются, центрифугирование затруднено ввиду больших объемов растворов [6].

Для соосаждения цезия-137 при анализе пищевых продуктов используются ферроцианиды никеля или кобальта [1], при анализе морской воды - ферроцианид меди [2]. Однако, степень извлечения цезия-137 не превышала 92 %.

Цезий в растворах поваренной соли, рассолах и высокоминерализованных водах находится в связанной форме, преимущественно с гуминовыми и фульвокислотами, что затрудняет его количественное концентрирование сорбцией и соосаждением (табл.1) [1].

Таблица 1

### Результаты определения цезия.

Объект анализа	Введено Cs, · 10 <sup>-7</sup> %	Найдено Cs · 10 <sup>-7</sup> , % / Sr(p=0,95, n=6)					
		Без обработки	С кипячением с переульфатом аммония в кислой среде	С УЗ обработкой 22 кГц, 7 Вт/см <sup>2</sup> , 3 мин	С УЗ обработкой 22 кГц, 2 Вт/см <sup>2</sup> , 2 мин в присутствии H <sub>2</sub> O <sub>2</sub>	С УЗ обработкой 22 кГц, 7 Вт/см <sup>2</sup> , 3 мин при насыщении пробы CO <sub>2</sub>	С УЗ обработкой 22 кГц, 2 Вт/см <sup>2</sup> , 2 мин в присутствии H <sub>2</sub> O <sub>2</sub> при насыщении и пробы CO <sub>2</sub>
Поваренная соль ГП «Артемсоль»	0	-	-	-	-	-	-
	2,00	2,07 /0,03	1,76 /0,09	1,86 /0,06	1,90 /0,05	1,87 /0,07	2,06 /0,05
Поваренная соль Генич. солезавод	0	4,26 /0,03	8,97 /0,08	9,26 /0,05	9,31 /0,05	4,29 /0,06	5,31 /0,05
	2,00	6,11 /0,04	10,45/0,09	11,19/0,06	11,29/0,06	6,19/0,06	7,27/0,06
Поваренная соль Генич. солезавод*	0	4,26 /0,03	8,76 /0,08	4,35 /0,05	9,31 /0,05	4,29 /0,06	5,31 /0,05
	2,00	6,11 /0,04	10,58/0,09	6,29/0,06	11,29/0,06	6,19/0,06	7,27/0,06
Рассол, Славянский солезавод	0	3,81 /0,04	9,43 /0,09	9,66 /0,06	9,68 /0,06	3,96 /0,06	5,76 /0,06
	2,00	5,75 /0,03	11,55/0,08	11,70/0,07	11,73/0,07	6,01/0,07	7,88/0,07
Вода, Сиваш, район Генич. солезавода	0	1,88 /0,05	6,04 /0,09	6,34 /0,06	6,46 /0,06	2,06 /0,06	2,76 /0,06
	2,00	4,01 /0,04	7,85 /0,08	8,43/0,07	8,59/0,07	3,09/0,07	4,81/0,07

\* с радиопротектором

Для перевода металлов в ионные формы используется кипячение растворов проб в течение 40 мин с сильными окислителями (H<sub>2</sub>SO<sub>4</sub>-(NH<sub>4</sub>)<sub>2</sub>S<sub>2</sub>O<sub>8</sub>, HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>-KMnO<sub>4</sub>, что удлиняет и усложняет анализ, увеличивает риск загрязнения растворов проб примесями цезия из используемых реагентов [1].

При анализе поваренной соли для перевода соединений свинца, меди, кадмия, ртути, цинка и мышьяка в соосаждаемые формы и для интенсификации концентрирования соосаждением используется воздействие ультразвука (УЗ), что способствует повышению экспрессности, чувствительности и улучшению метрологических характеристик анализа [1].

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Целью работы является исследование возможности использования воздействия УЗ для перевода соединений цезия в соосаждаемые формы, а также для интенсификации процессов концентрирования цезия.

**Экспериментальная часть.** Валовое содержание цезия определяли атомно-эмиссионным методом в пламени «ацетилен-воздух» при длине волны 852 нм на спектрометре ААС-3 (Германия). Цезий-137 определяли на бета-радиометре Руб-01П (Россия) с детектором БДЖБ-06П (Россия). УЗ обработку растворов проводили с использованием модернизированного ультразвукового диспергатора УЗДН-1М с набором магнитоотрицательных излучателей, позволяющих вести обработку растворов частотой 15-47 кГц, интенсивностью от 0,5 до 25 Вт/см<sup>2</sup>. Для отделения осадков от раствора использовали центрифугу Т-23 (6000 об/мин). Опыты проводились в реакторе с водяной рубашкой при температуре (20±1) °С. Применяли

бидистиллированную воду и реактивы квалификации не ниже х.ч. Интенсивность УЗ определяли расчетным и экспериментальным методами [1].

Анализируемые растворы поваренной соли обрабатывали УЗ частотой 18-44 кГц, интенсивностью 4-15 Вт/см<sup>2</sup> в течение времени 0,5-5,0 мин. В полученном растворе устанавливали содержание цезия атомно-эмиссионным методом после выделения цезия соосаждением на гексацианоферрате двухвалентной меди [4]. Причем, для повышения чувствительности определения цезия, в анализируемый раствор вводили хлорид натрия до 30 г/дм<sup>3</sup>, согласно рекомендаций приведенных в [1].

**Результаты и их обсуждение.** В результате опытов установлено, что оптимальными параметрами УЗ являются: частота 18-44 кГц, интенсивность более 7 Вт/см<sup>2</sup> в течение времени более 3 мин (табл.2).

Таблица 2

Влияние параметров ультразвука на степень разрушения органических соединений цезия.

Интенсивность УЗ, Вт/см <sup>2</sup>	Степень разрушения орг. соед. Cs, %	Частота УЗ, кГц	Степень разрушения орг. соед. Cs, %	Время возд. УЗ, мин.	Степень разрушения орг. соед. Cs, %
4	67	15	95	0,5	84
5	85	18	98	1	93
6	94	20	98	2	96
7	98	44	98	3	99
8	98	45	96	4	99
9	98	47	94	5	99

Однако, при анализе поваренной соли с радиопротектором (содержание Fe<sub>4</sub>[Fe(CN)<sub>6</sub>]<sub>3</sub> - 1%), перевода цезия в соосаждаемые формы воздействием только одного УЗ, даже интенсивностью 15 Вт/см<sup>2</sup> достичь не удастся (табл.1). В связи с чем, изучено ведение процесса в присутствии окислителей. В качестве окислителей изучено действие азотной кислоты, перекиси водорода (30%), смеси перекиси

водорода и азотной кислоты (1:1) и смеси азотной и соляной кислот (1:3), рекомендуемых для интенсификации пробоподготовки воздействием микроволнового облучения [8]. Как следует из табл.3, положительный эффект наблюдался при ведении процесса в присутствии всех вышеприведенных окислителей.

Таблица 3

Влияние окислителей на степень извлечения цезия.

Объект анализа	Найдено Cs · 10 <sup>-7</sup> , % / Sr(p=0,95, n=6)				
	Без окислит.	HNO <sub>3</sub>	H <sub>2</sub> O <sub>2</sub>	HNO <sub>3</sub> +H <sub>2</sub> O <sub>2</sub>	HNO <sub>3</sub> +HCl
Поваренная соль Генич. солезавод	4,26 /0,03	9,29/0,05	9,31/0,05	9,39/0,06	9,36/0,06
Поваренная соль Генич. солезавод*	4,26 /0,03	9,31/0,06	9,31/0,05	9,37/0,06	9,35/0,06
Рассол, Славянский солезавод	3,81/0,04	9,71/0,06	9,68/0,06	9,74/0,07	9,70/0,07
Вода, Сиваш, район Генич. солезавода	1,88 /0,05	6,42/0,06	6,46/0,06	6,51/0,07	6,44/0,07

\* с радиопротектором

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SJIF (Morocco) = 2.031

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PIF (India) = 1.940

При этом, для количественного извлечения цезия необходимо на 1 дм<sup>3</sup> раствора пробы не менее 10 см<sup>3</sup> азотной кислоты или 5 см<sup>3</sup> перекиси водорода или такое же количество смеси перекиси водорода и азотной кислоты или смеси азотной и соляной кислот. Таким образом, оптимальным является введение перекиси водорода. Использование воздействия УЗ в присутствии перекиси водорода позволяет количественно перевести цезий в сосаждаемые формы и улучшить метрологические характеристики анализа, при этом интенсивность УЗ может быть уменьшена с 7 до 2 Вт/см<sup>2</sup> (табл.1).

В оптимальных условиях степень сосаждения цезия достигает 92 % и ее не удается повысить увеличением количества коллектора и времени контакта осадка с раствором [4].

Для повышения степени сосаждения использовано воздействие УЗ. Параметры ультразвука: частота 20-44 кГц, интенсивность 2 Вт/см<sup>2</sup>, время воздействия 30 с подбирались экспериментально (табл.4). При этом степень сосаждения повышается до 98-99 %. Количество коллектора может быть уменьшено в 5 раз.

Таблица 4

### Влияние параметров ультразвука на степень сосаждения цезия.

Интенсивность УЗ, Вт/см <sup>2</sup>	Степень сосаждения Cs, %	Частота УЗ, кГц	Степень сосаждения Cs, %	Время возд. УЗ, с.	Степень сосаждения Cs, %
0,5	36	15	80	10	76
1	88	18	92	15	80
2	98	20	99	20	83
4	98	44	99	25	90
5	99	45	90	30	98
6	98	47	87	35	99

Для установления определяющего фактора воздействия УЗ использовали ведение процесса в условиях невозможности протекания звукохимических реакций (насыщение пробы СО<sub>2</sub>) при постоянной температуре [7]. В результате опытов установлено, при переводе цезия в сосаждаемые формы определяющим фактором интенсифицирующего действия УЗ является протекание звукохимических реакций, а при интенсификации концентрирования сосаждением - перемешивающее и диспергирующее действие УЗ (табл.1).

Таким образом, установлено, что применение УЗ пробоподготовки при определении цезия в высокоминерализованных водах, рассолах и поваренной соли позволяет повысить экспрессность, снизить предел обнаружения и улучшить метрологические характеристики анализа.

Разработана методика определения цезия и цезия-137 в высокоминерализованных водах, рассолах и поваренной соли.

*Методика определения цезия и цезия-137 в высокоминерализованных водах, рассолах и поваренной соли.*

Навеску поваренной соли 100,00 г растворяют в бидистиллированной воде и доводят объем раствора до 1000 см<sup>3</sup>(при анализе рассолов приливают количество рассола,

содержащее 100 г хлорида натрия, а при анализе высокоминерализованных вод берут 1000 см<sup>3</sup> пробы воды), приливают 5 см<sup>3</sup> перекиси водорода (30 %). Опускают магнитострикционный излучатель и воздействуют УЗ частотой 22 кГц, интенсивностью 2 Вт/см<sup>2</sup> в течение 3 мин. Приливают 1 см<sup>3</sup> азотной кислоты (5 моль/дм<sup>3</sup>), 2 см<sup>3</sup> раствора меди азотнокислой (2 моль/дм<sup>3</sup>), 3 см<sup>3</sup> раствора ферроцианида калия (2 моль/дм<sup>3</sup>). Опускают магнитострикционный излучатель и воздействуют УЗ частотой 22 кГц, интенсивностью 2 Вт/см<sup>2</sup> в течение 30 с. Осадок от раствора отделяют сифонированием и центрифугированием. Осадок высушивают при температуре 50 °С, после охлаждения до комнатной температуры взвешивают, переносят в кювету бета-радиометра и определяют активность при времени измерения количества импульсов в течение 100 с. Для определения валового содержания цезия осадок растворяют в 6 см<sup>3</sup> соляной кислоты (1:1) при нагревании, приливают 1,5 см<sup>3</sup> раствора хлорида натрия и разбавляют бидистиллированной водой до 10 см<sup>3</sup>. Определение ведут атомно-эмиссионным методом при длине волны 852 нм в пламени ацетилен-воздух.

Предел обнаружения цезия - 2·10<sup>-8</sup> %, цезия-137 - 1·10<sup>-13</sup> Ку/кг.

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Правильность определения цезия проверяли методом добавок на растворах проб поваренной соли, рассолах и высокоминерализованных водах (табл. 1).

Правильность определения цезия -137 проверяли, сравнивая полученные результаты с результатами гамма-спектрального анализа (табл. 5).

**Таблица 5**

**Результаты определения цезия-137 разработанным и гамма-спектральным методами.**

Объект анализа	Найдено цезия-137, Бк/кг(n=6, p=0,95)	
	Гамма-спектральным метод.	Разработанным метод.
Поваренная соль ГП «Артемсоль»	4,59± 0,56	4,81± 0,33
Поваренная соль Генич. солезавод	12,95± 1,63	13,51± 0,93
Рассол, Славянский солезавод	23,05± 3,96	24,57± 1,78
Вода, Сиваш, район Генич. солезавода	43,11± 5,25	42,81± 2,92

**Выводы.** Изучено применение УЗ при определении цезия в высокоминерализованных водах, рассолах и поваренной соли: для перевода соединений цезия в сосаждаемые формы и для интенсификации концентрирования сосаждением на гексацианоферрате двухвалентной меди. Экспериментально установлено, что определяющим фактором интенсифицирующего воздействия УЗ при переводе цезия в сосаждаемые формы является протекание звукохимических реакций, а при интенсификации концентрирования

сосаждением - перемешивающее и диспергирующее действие УЗ. Разработана экспрессная методика определения цезия и цезия - 137, основанная на сосаждении цезия на гексацианоферрате двухвалентной меди с ультразвуковой интенсификацией процесса. В полученном концентрате цезий определяли атомно-эмиссионным методом при длине волны 852 нм в пламени ацетилен-воздух, а цезий-137с использованием бета-радиометра. Предел обнаружения цезия -  $2 \cdot 10^{-8}\%$ , цезия-137 -  $1 \cdot 10^{-13}$  Ку/кг.

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JIF = 1.500

SIS (USA) = 0.912  
PIHII (Russia) = 0.179  
ESJI (KZ) = 1.042  
SJIF (Morocco) = 2.031

ICV (Poland) = 6.630  
PIF (India) = 1.940

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Gennady Evgenievich Markelov**

Candidate of Engineering Sciences,  
associate professor,

Bauman Moscow State Technical University,  
Moscow, Russia

[markelov@bmstu.ru](mailto:markelov@bmstu.ru)

**SECTION 21. Pedagogy. Psychology.  
Innovations in the field of education.**

## TEACHING THE BASICS OF MATHEMATICAL MODELING. PART 1

**Abstract:** *The article outlines some important aspects related to teaching the basics of mathematical modeling. It provides recommendations for the development of content and framework of the discipline teaching the basics of mathematical modeling. The application of such aspects and guidelines enhances the quality of graduates' training and increases their competitiveness.*

**Key words:** *mathematical modeling, quality training, competitiveness.*

**Language:** *English*

**Citation:** Markelov GE (2016) TEACHING THE BASICS OF MATHEMATICAL MODELING. PART 1. ISJ Theoretical & Applied Science, 01 (33): 69-71.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-14> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.14>

### 1. Introduction

Mathematical modeling is frequently used in many knowledge-intensive industries, such as machine and instrumentation engineering. Continuous development of these industries requires highly qualified experts with necessary skills who are able to address any arising research and engineering challenges by rational application of mathematical modeling. In this context, it is critical to teach the basics of mathematical modeling focused on studying advanced methods of building mathematical models, ways of quantitative and qualitative analysis of mathematical models, methods of rational use of mathematical modeling in machine and instrumentation engineering.

The purpose of this article is to outline some important aspects of development of content and framework of the discipline teaching the basics of mathematical modeling. The application of such aspects and guidelines improves the quality of graduates' training for work in different sectors of machine and instrumentation engineering and increases their competitiveness.

These aspects are outlined to include guidelines described in [1; 2].

### 2. The Entry Level of Students

Mathematical modeling of advanced machine and instrumentation engineering objects relies on the knowledge of science and technology and uses almost all branches of mathematics. Thus, the content of the discipline teaching the mathematical

modeling basics is closely connected to the mathematical, science and engineering disciplines within the main education program, or their modules. In this context, it is worth looking at the Mathematics at a Technical University [3–23] set of textbooks that reflect extensive experience of the Bauman Moscow State Technical University in teaching the fundamentals of mathematics, its specific areas and a range of mathematical disciplines required in machine and instrumentation engineering.

Successful teaching of basics of mathematical modeling requires knowledge, skills and abilities gained from studying the preceding disciplines (or their modules), in particular, physics; mathematical analysis; analytical geometry; linear algebra; integrals and series; differential equations; theory of functions of a complex variable; probability theory, mathematical statistics and theory of stochastic processes; computing techniques; equations of mathematical physics; and mechanics and electrodynamics of continuous media.

### 3. Content and Structure of the Teaching Discipline

The content of the teaching discipline should cover various mathematical, science and engineering disciplines as well as establish a common and unbroken connection between them. Such a discipline should look at mathematical models of various engineering systems with a special focus on mechanical, thermal, hydraulic and pneumatic





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systems. For this purpose, it is a good idea to build a hierarchy of mathematical models of the same object.

The Basics of Mathematical Modeling course is described below as an example of such a teaching discipline. The author delivered the relevant lecture series at the Department of Applied Mathematics of the Bauman Moscow State Technical University. The content is based on the final, 21st issue of the Mathematics at a Technical University series [23] and comprises four modules: Fundamentals of Mathematical Modeling, Macro-Level Mathematical Models, Non-Linear Macro-Level Mathematical Models, and Micro-Level Mathematical Models.

### 3.1. Fundamentals of Mathematical Modeling

Mathematical Modeling and Technical Progress.

Main Stages of Mathematical Modeling.

Mathematical Model of a Technical Object.

Definition, Structure and Properties of Mathematical Models. Requirements for Mathematical Models. Principles of Building Mathematical Models.

Classification of Mathematical Models.

Decomposition Principle. Hierarchy of Mathematical Models and Their Presentation Forms (Micro-Level Mathematical Models, Macro-Level Mathematical Models, and Meta-Level Mathematical Models).

Introduction to Dimension Theory. Governing, Definable and Basic Parameters of Technical Objects. Pi Theorem. Examples of Use of Dimension Theory.

Mathematical Model Presentation in a Dimensionless Form. Similar Processes. Example Problems.

### 3.2. Macro-Level Mathematical Models

Equation of the State of a Standard Element. Features of Building Mathematical Models of Systems Consisting of a Large Number of Interrelated Standard Elements.

Primitive Elements of Technical Systems. Electromechanical, Electrothermal, Electrohydraulic and Electropneumatic Analogies.

Using Mathematical Models of Primitive Standard Elements. Mathematical Model of the Resistor, Which Resistance and Total Specific Heat Depends on Its Temperature. Mathematical Model of the Capacitor, Which Loses Its Electrical Charge Due to Imperfect Insulation.

Equivalent Scheme of a Technical System. Dual Electric Circuits. Correlation Between the Voltage Drop Law and Current Intensity Law in Dual Circuits.

Duality of Electromechanical Analogy. Building Mathematical Models of Mechanical Systems by Using the Second Variant of Electromechanical Analogy.

Mathematical Models of a Linear Oscillator and Their Analysis.

Using Lagrange Equations of the Second Kind to Build Mathematical Models of Technical Systems.

### 3.3. Non-Linear Macro-Level Mathematical Models

Examples of Problems Leading to Building of Non-linear Macro-Level Mathematical Models of Technical Systems.

Static and Stationary Mathematical Models. Some Non-Stationary Mathematical Models. Primitive Dynamical Mathematical Models.

Conservative System. Behavior of Some Conservative Systems.

Mathematical Models of Some Dissipative Systems.

Self-Oscillating Systems.

Approximate Analytical Methods for Dynamical Model Analysis.

### 3.4. Micro-Level Mathematical Models

Micro-Level Mathematical Models of Primitive Elements of Electrical Systems. Mathematical Model of a Long Linear Conductor with a Circular Cross-Section. Mathematical Model of a Flat Electric Capacitor. Analysis of Created Mathematical Models.

One-Dimensional Stationary Models of Thermal Conductivity. Building Stationary Models of Thermal Conductivity in a Porous Heat Protection Layer. Building One-Dimensional Stationary Models of Thermal Conductivity in a Curved Surface Wall. Building One-Dimensional Stationary Models of Thermal Conductivity in a Curved Surface Wall with Internal Heat Release. Analysis of Created Mathematical Models. Thermal Explosion.

One-Dimensional Non-Stationary Models of Thermal Conductivity. Building Non-Stationary Mathematical Models of Thermal Conductivity in a Flat Wall. Building Non-Stationary Mathematical Models of Thermal Conductivity in a Two-Layer Flat. Analysis of Created Mathematical Models.

One-Dimensional Non-Stationary Models of Hydraulic Systems. Building Mathematical Models of a Horizontal Pipeline Section. Boundary Conditions at Pipeline Ends. Examples of Building Mathematical Models of Hydraulic Systems. Analysis of Created Mathematical Models. Water Hammer.

Features of Using Mathematical Models. Examples of Using Mathematical Models of Thermal Conductivity for Solving Problems of Selecting Optimal Parameters for a Two-Layered Spherical Shell.

## 4. Conclusion

Thus, developing the contents and structure of the discipline teaching the basics of mathematical

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modeling should take into account students' entry level and guidelines focused on establishing a common and unbroken connection of mathematical, science, and engineering disciplines.

The abovementioned features and guidelines improve students' training for their future

employment in the machine and instrumentation engineering industries and enhance their competitiveness.

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ICV (Poland) = 6.630  
PIF (India) = 1.940

SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

**Gennady Evgenievich Markelov**

Candidate of Engineering Sciences,  
associate professor,

Bauman Moscow State Technical University,  
Moscow, Russia

[markelov@bmstu.ru](mailto:markelov@bmstu.ru)

**SECTION 21. Pedagogy. Psychology.  
Innovations in the field of education.**

## TEACHING THE BASICS OF MATHEMATICAL MODELING. PART 2

**Abstract:** *The article outlines some important aspects related to teaching the basics of mathematical modeling. It describes a unified approach to building mathematical models. Guidelines for using information and communication technologies and an individual approach to teaching are provided. The article also looks at details of organizing teaching sessions. The application of such aspects and guidelines enhances the quality of graduates' training and increases their competitiveness.*

**Key words:** *mathematical modeling, unified approach to the construction of models, information and communication technologies, individual approach, organization of training, quality training, competitiveness.*

**Language:** English

**Citation:** Markelov GE (2016) TEACHING THE BASICS OF MATHEMATICAL MODELING. PART 2. ISJ Theoretical & Applied Science, 01 (33): 72-74.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-15> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.15>

### 1. Introduction

Today, mathematical modeling is extensively used in machine and instrumentation engineering. In this context, it is critical to teach a discipline focused on studying advanced methods of building mathematical models, ways of quantitative and qualitative analysis of mathematical models, methods of rational application of mathematical modeling to machine and instrumentation engineering.

The purpose of this article is to outline some important aspects related to the basics of mathematical modeling. The application of such aspects and guidelines improves students' training for their future employment in the machine and instrumentation engineering industries and enhances their competitiveness.

The article takes into account the guidelines formulated in [1; 2].

### 2. Unified Approach to the Construction of Models

The potential of mathematical modeling that are described in detail in the literature (for example, [3–6]) are often used inefficiently. The reason for this is that the mathematical model does not have the desired properties.

Developing a mathematical model with required properties in terms of a specific research problem involves compliance with the requirements for such a mathematical model. Such requirements

are inconsistent and may be met in practice only on a reasonable compromise basis.

Generally, building such models relies on the rules and recommendations arising from the accumulated experience in developing mathematical models. The mathematical modeling principles are of special interest. For example, [7] defines the principles whose reasonable use in aggregate allows us to implement a consistent approach to building mathematical models with required properties in terms of a specific research problem. Examples of building such models are provided in [8; 9].

Experience shows that a unified approach to building mathematical models is promising and deserves appropriate attention.

### 3. Information and Communication Technologies

Teaching the basics of mathematical modeling involves using the following electronic materials:

- ✓ theoretical materials, such as textbooks, manuals, and lecture notes;
- ✓ practice materials, such as exercise books and workbooks;
- ✓ methodical materials, such as study guides;
- ✓ reference books, such as terminological dictionaries and reference guides;
- ✓ any other necessary materials, such as multimedia presentations and software.



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Students should be provided with e-learning tools, self-testing opportunities and online consultations.

Studying a discipline related to the basics of mathematical modeling involves learning information loaded with various concepts and terms related to different mathematical disciplines in combination with terminology and extensive information from science and engineering disciplines. This creates learning challenges to be met with an electronic information reference system. Features of development of such a system are described in [10].

One good example of using information and communication technologies is the Basics of Mathematical Modeling, a multimedia course developed by the author at the Department of Applied Mathematics of the Bauman Moscow State Technical University. The lecture series was delivered in specially equipped classrooms making it possible to view multimedia presentations, use online resources on the equipment connected to wireless networks.

Introduction of information and communication technologies into the learning process enhances training effectiveness; however, it takes considerable and time-consuming efforts requiring extensive knowledge as well as the use of advanced hardware and software.

Extensive use of sophisticated information and communication technologies in the training process fosters further development of information and educational environment, which makes successful training possible.

#### 4. Organization of Teaching

The curriculum of a discipline teaching the basics of mathematical modeling involves lectures as well as practical training. Lectures teach methods of building mathematical models with the desired properties, ways of quantitative and qualitative analysis of mathematical models, and methods of practical interpretation of the results of mathematical modeling. Practical training sessions teach students to develop mathematical models, select the appropriate analytical tools for the designed mathematical models, and process and present the results of mathematical modeling.

Knowledge and skills are reinforced by individual homework. Such homework is related to building a hierarchy of mathematical models and analysis of the models, which allows students to make meaningful conclusions.

Organization of training classes and a system of monitoring the teaching results should enable fair assessment of teaching outcomes, motivate students

to work systematically, enhance learning competition, and develop performance self-control ability.

#### 5. Individual Approach

Individual approach to training requires consistent monitoring of each student's performance throughout the semester, fair assessment of knowledge and skills gained, while taking into account the student's personal qualities and individual abilities. This will enable taking timely measures aimed at improving the learning performance, development of personal qualities and individual abilities of students. For example, students may be assisted in adapting to the training process, informed selection of a learning trajectory, and teaching may be customized for each student by offering additional materials for self-study.

An individual training approach enhances the effectiveness of learning, encourages the development of personal qualities and individual abilities; however, such individual approach involves provision of the relevant learning aids and development of student incentive schemes.

#### 6. Conclusion

Thus, the article outlines some important aspects related to teaching the basics of mathematical modeling and draws the following conclusions:

- ✓ attention should be given to a unified approach to building mathematical models with required properties in terms of a specific research problem;
- ✓ it necessitates active introduction of advanced information and communication technologies into the teaching process and further development of the information and learning environment;
- ✓ compliance with the requirements for a discipline teaching the basics of mathematical modeling involves the appropriate organization of the teaching classes and fair assessment of learning outcomes;
- ✓ the considered properties of the individual approach enhance learning effectiveness and development of personal qualities and individual abilities of students.

The above-mentioned aspects and guidelines improve the students' quality of learning for their future employment in the rapidly changing world, total interdependency and global competition.

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SOI: [1.1/TAS](http://s-o-i.org/1.1/TAS) DOI: [10.15863/TAS](https://doi.org/10.15863/TAS)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>



**Konstantin Ivanovich Kurpayanidi**

PhD in Economics,  
Professor of the Russian Academy of  
Natural Sciences,  
Fergana Polytechnic Institute,  
Uzbekistan  
[w7777@mail.ru](mailto:w7777@mail.ru)



**Elnorahon Abdukarimovna Muminova**

PhD in Economics,  
Docent,  
Fergana Polytechnic Institute,  
Uzbekistan

**SECTION 31. Economic research, finance,  
innovation, risk management.**

## MODERN APPROACHES TO DEFINING THE NATURE AND FUNCTION OF NATIONAL INNOVATION SYSTEM OF THE UZBEK ECONOMY

**Abstract:** The paper attempts to carry out a systematic analysis of the methods and approaches of domestic and foreign scientists to the definition of "national innovation system". At the same time, we studied the function of the national innovation system. Based on these studies the authors offer their own definition of innovative systems for the economy of Uzbekistan, along with that formulated internal and external functions of the National Innovation System of Uzbekistan.

**Key words:** innovation, innovation system, methodology, national innovation system, the economy of Uzbekistan.

**Language:** English

**Citation:** Kurpayanidi KI, Muminova EA (2016) MODERN APPROACHES TO DEFINING THE NATURE AND FUNCTION OF NATIONAL INNOVATION SYSTEM OF THE UZBEK ECONOMY. ISJ Theoretical & Applied Science, 01 (33): 75-85.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-16> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.16>

The international community is going through in the last decades the process of innovative updating that has increasingly growing positive impact on the dynamics and quality of economic growth.

To determine the nature and functions of the national innovation system theory of systems should be addressed. Yu. P. Surmin, author of the widely cited textbook, writes: "Isolation and construction of the system is carried out as follows: the aim is put, that must be provided by system; defined function (or functions), which provides the implementation of function. The aim is a condition at which trend movement of the object is aimed. The goal is usually caused by a problem situation, which can not be resolved in cash. And the system is a means of solving the problem" (Fig. 1 1) [36].

The study of frequently cited scientists allowed the public to systematize the definition of "national innovation system" used in international practice and scientists of Uzbekistan, the CIS countries. Studies of

evolution of the concept of "national innovation system" and the analysis of modern approaches to the definition of the concept allowed to formulate the following conclusions.

Firstly, to date there is no single, universally accepted concept of "national innovation system". The lack of common views stipulates different approaches to the methodology of formation of the national innovation system and its components.

Secondly, to date, there is no three main interpretations of the concept of "national innovation system", as E. V. Morgunov and G. Snegirev considers (a set of institutions, a complex conjugate of economic instruments and activities, a part of the national economic system [20. 7-21 p], and not four, as suggested by S. P. Lapaev (combination of different elements and components, a set of measures and mechanisms; instrument of economic policy; the control object (the state)) [19].

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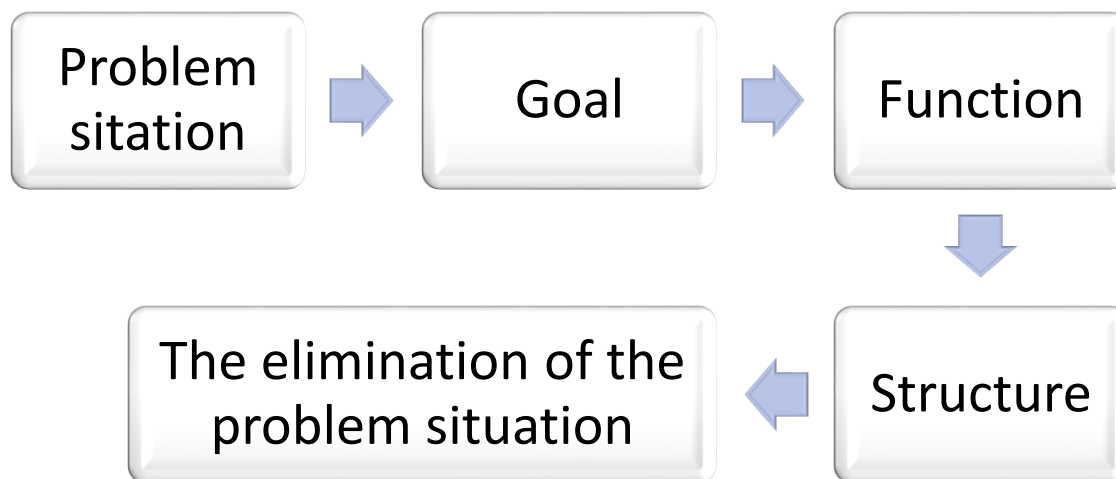


Figure 1.1. Constructing system.

In the total population of approaches to the definition of the national innovation system eight directions and accordingly the authors can be distinguished, that follow these directions. Thus, the national innovation system is defined as:

- as an aggregate (set) consisting of institutions: R. Nelson, N. Rosenberg [56]; S. Metcalfe [55]; N. I. Ivanov [10]; E. V. Morgunov, G. V. Snegirev [20]; S. V. Shaposhnikova [40.27-31 pp.]; K. I. Kurpayanidi [18. 52 p]; S. S. Abdullayev A. M. Sadykov [1. 45 pp]; M. K. Faizulloev [37];
- as an aggregate (set) institutions and various elements and components: C. Edquist, B. O. Lundvall [42]; P. Patel, K. Pavitt [58]; S. Faison [44]; E. M. Babosov [2]; R. I. Hansevyarov [38];
- as a network of institutions (organizations, agencies) and targeted (directed) activities: C. Freeman [45,46]; H. Nyosi, P. Saviotti, B. Bellon, M. Crow [57]; V. S. Bochko, E. G. Animitsa, V. N. Belkin [3]; I. G. Dezhina, B. G. Saltykov [5. 118-128 pp]; O. G. Golichenko [4]; E. L. Savina [30]; writing team of scientists MGIMO [22]; L. A. Trofimova, V. V. Trofimov [36]; S. P. Lapaev [19]; F. G. Kasumov, A. D. Guseynova [11];
- as various elements, components, and the interaction between them: B. O. Lundvall [51]; N. F. Chebotarev [39]; V. E. Saktaev, S. R. Haltaeva [31];
- as part of the national economic system: Y. S. Emelyanov [6];
- as a triple helix (the concept of knowledge production: University -Government - business (enterprise, industry), formulated G. Etzkowitz and L. Lidsdorf in 2000; A. Goto [47]; N. I. Ivanov [10];
- through a broad interpretation, which includes an interdisciplinary approach: C. Edquist [43]; B. N. Kuzyk, Y. V. Yakovets [17]; I. G. Salimyanova [32];
- through social capital: K. Freeman, considering the national innovation system as a

"social ability of the nation to technical changes"[45]; B. O. Lundvall, B. Johnson, E. S. Anderson, B. Dalum, when considering the national innovation system to explore the "interaction of the four types of capital: industrial, natural, intellectual and social"[54]; B. O. Lundvall, said that scientists have criticized "... a broad approach to the national innovation system, since the broad approach of national innovation system includes virtually everything that is in the state. It is necessary to consider social capital as well"[51]; B. O. Lundvall, B. Gregersen, B. Johnson, E. Lorenz, based on consideration of the national innovation system as the interaction between users and manufacturers in connection with the development of new products[53].

Thirdly, when considering the national innovation system, only foreign authors examine in detail the adjective "national", but does not include in the definition of the national innovation system any special characteristics of the state as a legal order in a certain territory. Uzbek scientists, adjectives "national" and "state" consider as synonyms of the word, without the emphasis on their relationship and differences. Essentially, the scientists use as synonyms both the notion of "national innovation system" and "innovation system".

None of the proposed definitions of the national innovation system, both foreign and domestic scientists, does not contain the characteristics of the state or national characteristics, implying that it is the composition and characteristics of the institutions, the various elements and components, mechanisms of interaction in the national innovation system, or public policy and allow to highlight features of national innovation system for each state.

Fourthly, in some proposed definition in detail investigated (registered) the process of "knowledge management", in some studies associated with

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knowledge of technologies or simply emphasized technological process.

In the process of knowledge management attention is emphasized by: B. O. Lundvall [52], Ch. Edquist [43], N. I. Ivanova [10], Yu. S. Emelyanov [6].

The technological process was highlighted in the works of C. Freeman [45]; E. V. Morgunova [20], I. G. Salimyanovoy [32].

The process of knowledge management and technology was considered by following scholars: S. Metcalfe[55]; N. F. Chebotarev[39]; C. Freeman[45]; V. S. Bochko, E. G. Animitsa, V. N. Belkin[3]; O. G. Golichenko[4], E. L. Savina[30], L. A. Trofimova, V. V. Trofimov[36], M. K. Faizulloev[37], S. P. Lapaev[19], R. I. Hansevyarov [38].

Fifthly, over time, scientists are developing their views on the understanding of the national innovation system. So, C. Freeman in 1987 considers the national innovation system as a network of institutions [46], and in 2002 as the nation's social capacity to make technical changes [45]. B. O. Lundvall in 1992 understands the national innovation system elements and relationships [52], and in 2011 work the focus is on the interaction of users and producers due to the development of new products, etc. [53]. In a particular case, we can quote B. N. Kuzyk about the economy of national security: "The optimal structure of the economy of national security is the one which corresponds historically to the needs and capabilities of the state, can be reproduced, modified and improved in accordance with the changes of internal and external conditions of development"[16,17].

In parallel with the analysis of scientific views of scientists the regulations on the subject of "national innovation system" of Uzbekistan and the countries of the Commonwealth of Independent States (CIS) was also investigated. The CIS countries have been selected as the former post-soviet space (USSR), on whose territory the common science and technology policy took place, and with the acquisition of independence of CIS countries, as well as Uzbekistan, they themselves started to determine the direction of their socio-economic development.

The analysis allowed us to formulate the following conclusions.

Firstly, to date, legal and regulatory framework of the Republic of Uzbekistan does not contain a formal definition of "national innovation system", this definition is present in the concept of innovative development of the Republic of Uzbekistan to 2020 as "a set of organizations (structures), institutions, relationships of knowledge and technologies taking into account all sectors of the economy and public life"[12].

Secondly, the term "national" in the legal framework of the Republic of Uzbekistan is rarely used.

In the legislation of Uzbekistan, the word "national" is present in the laws "On Education"[9], "On Defense"[8], "On national training programs"[7].

The word "national" is often used in combination with the word "interest". In our opinion, the national interests of Uzbekistan are understood as a set of macroeconomic and macro politic tasks of the state. National interests are provided by institutions of state power, performing its functions in collaboration with community organizations.

Thirdly, the former post-Soviet countries - 11 CIS countries - independent documents on the innovative development of the country exist only in Belarus, Kazakhstan, Kyrgyzstan and Uzbekistan. Determination of the national innovation system of the Republic of Belarus and the Russian Federation meets the definition of "innovation system" described in «The concept of innovative development of the Republic of Uzbekistan for 2012-2020» [12]. In Kazakhstan, the development of the national innovation system is provided through a regional innovation system. Kyrgyzstan has defined only the main directions of innovative development of the country [13].

Analysis of the evolution of the concept and the concept of "national innovation system", the concept of national innovation system and the theory of systems have allowed to define national innovation system in the classification categories of the system approach (Fig. 2).

National Innovation System in the category of:

- understanding of the system – it is a system of the universe, which is a combination of the system and its environment;
- properties of the system has: the emergence - irreducibility to the properties of the elements of the system; openness - the absence of complete isolation from the environment and the presence of degrees of freedom in the behavior of the elements;
- system status - organizational ordering system in accordance with system-factors;
- system analysis: structural analysis - analysis of the structure of the system as a set of relationships between the parts, identifying values for a single element of a structured whole in certain way; structural and functional analysis - selection of elements of interaction and determination of their place and role in the functioning of the system;
- variety of effects: an integrative effect - the appearance of new qualities inherent in the system as a whole; adaptability - property of the system to preserve their identity in terms of variability of the environment; a synergistic effect - the effect of multiplying the result of the system, which increases the amount of results of the functioning of its individual components;
- processes: functioning- operation of the system over time; management - bringing the system

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into balance or achieving goals; integration - the process and the mechanism of association and connectivity of elements; adaptation - the adaptation of the system to the environment without losing their identity;

- reflection of the system: Information - details, knowledge of observer about the system, reflection of its diversity;

- environment of the system: environment - environment system or set of objects, which are located beyond the boundaries of the system, they affect it, but do not belong to her; internal environment - a set of objects that are within the boundaries of the system, affects its behavior, but do not belong to her.

The analysis has allowed the author to formulate a definition of "national innovation system". According to the authors of this study, the national innovation system is a complex, open, dynamic, organized system-universe, based on

economic relations and the political system of the country, which regulates with norms rights of innovation processes, internal and external institutional environment for economic actors in order to preserve and increase national wealth.

The key challenge in all countries is to accelerate the technological development of the global economy, increasing competition for the factors that determine the competitiveness of national innovation systems. Based on this, the aim is to increase the level of innovation activity of the economy. Currently, due to the reduction of the period of realization of scientific innovations to entrepreneurs/enterprises, it is necessary to quickly respond to changing national and international needs. Rapid response can only provide a temporary advantage, as it can be used, copied, imitated by competitors in both domestic and foreign markets. Innovation activity - the most flexible indicator of status and competitiveness of the national economy.



**Fig.2. The national innovation system in the classification of the categories of systematic approach.**

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Innovative activity is manifested through the innovative activities of economic entities (individuals and entities) operating in particular institutional environment.

In any system, including the national innovation system, there are certain functions. Analysis of the post-Soviet scientists' works allowed to count about 30 functions of the national innovation system.

Foreign scientists are more or less unanimous in allocation of functions of innovative systems and national innovation systems. Scientist of Technological University Chalmers (Sweden) A. Johnson said: "The aim of the innovation system is to develop, distribute and use innovation. There are two main features that are two directly related to the innovative process: 1) the identification of problems, bottlenecks of the innovation system; 2) the creation of new knowledge. The third function is related to the maintenance of the innovation process and includes: 3.1) providing incentives for innovation; 3.2) providing necessary resources; 3.3) direction of search, i.e., determining strategic priorities; 3.4) determining the potential for growth of innovation; 3.5) facilitating the exchange of information and knowledge; 3.6) stimulating innovation and the creation of markets of innovation; 3.7) reduction of social uncertainty markets, i.e. preventing or resolving conflicts between companies and individuals; 3.8) counteracting resistance to changes that arise in the community with the introduction of changes, i.e. the legitimacy of the introduction of a mechanism for innovation"[50].

M. P. Hekkert and S. O. Negro in their work in 2005 are emphasizing following functions: "1) entrepreneurial activities; 2) the development of knowledge (training); 3) diffusion through the knowledge network, i.e. exchange of information; 4) guide to finding the priority areas of activity; 5) formation of the market; 6) resource mobilization; 7) establishment of legitimacy/counteraction to resist change". In their later work in 2007 they once again convincingly are limited to listed seven functions [49].

Based on the fact that:

- "function - (lat. *function* - fulfillment, implementation) - 1) purpose; 2) activity, duty, work"[29];
- "functions are the directions of activity of the system that interacts with the environment"[34];
- "function inherent in the system and its components, and functions of the system is integrated result of the operation of its constituent parts".

Following conclusions can be made.

Firstly, national innovation system is given a number of "alien" functions. For example, the formation of a national innovation policy; development and maintenance of legal and regulatory framework; the choice of priorities in the field of innovation, researches and developments etc. refer to public functions and functions of authorities of the State (which have more specific nature). Further, generation of knowledge, dissemination of knowledge, storing knowledge etc. relate to the education system.

Secondly, neither of author does not emphasize internal and external factors of the national innovation system, in spite of active development lately supranational and global processes in the world economy.

According to S. V. Kortov, "in terms of interaction with the environment innovation system can be:

- active-adaptive, i.e. to achieve its goal by purposeful transformation of environment;
- passive-adaptive - to modify the target when changing the target of environment without the purposeful impact on the environment;
- active-passive, i.e. to use both strategies"[15].

Thirdly, as national innovation system on the category of the manifold effects has adaptability (property of the system to preserve their identity in terms of variability of the environment), the policies and actions of the state must not cause a system to have a crisis situation. National innovation system should have features like "properties in the dynamics" that lead to the implementation of goal, even in changing conditions.

Table. 1 shows the theoretical model of national innovation system, which were considered by government of Uzbekistan as a potential for use in the country:

- market and evolutionary retaining the support and financing of scientific research and technological development;
- market and radical with support and financing of only those areas of research and technological developments that are needed to implement the functions of the state;
- institutional "completion", envisaging the development of the missing elements and the spread of new forms of innovation;
- innovative and active - through the mechanism "supply creates demand," with minimal involvement of state.



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**Table 1**  
**Theoretical model of development of the national innovation system (NIS) features of the approaches to the implementation of the state innovation policy in foreign countries.**

MODEL	FORMATION OF NATIONAL INNOVATION SYSTEM	FUNCTIONS OF THE STATE	FEATURES OF THE MODEL	MAIN RISKS
Market Evolutionary	Effective demand generates an adequate offer	1. Support (free subsidizing) of production system of scientific manpower, in the sphere of fundamental research. 2. Reducing transaction barriers on the way to innovation and to stimulation of private demand for innovation	Structural elements of the NIS are created and developed under the influence and the extent of effective demand subjects (one of which is the State itself in the framework of its functions)	Storing segmentation and incomplete NIS, increasing technological dependence of the economy on foreign producers of technology
Market Radical	Effective demand generates an adequate offer	Financing only those areas that are required to implement the functions of the state	The reduction of the public sector	Chance of dismantling national basic science and reduction of production of scientific staff
Institutional "completion"	Development of the missing elements and the spread of new forms of	State support of NIS	Enhanced scattering of budgetary resources for a variety of existing and new directions	Automatic generation of competitive NIS will not happen due to the low quality of its existing elements
Innovative Active	Supply demand creates	The increase of expenses on the commercialization of advanced technologies to quickly bring to the practical applicability the existing level of backlog	Low demand for innovation in the business sector due to the lack of supply of innovative product	Lack of demand on advanced commercial technologies
"Knowledge-active"	The focus shifted to the beginning of the innovation cycle and on the development of innovative education	1. Intense investment in human capital. 2. "Connection" of supply and demand and the needs of formation in the various innovation institutes	The creation of "innovative person" who will be inclined to innovation and new knowledge, regardless of the main areas of activity	Long term perspective of realization and deriving effect



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Table 2 presents main areas of modern innovation policy of foreign countries. Each country defines on its own way, through implementation of

appropriate public policies, directions of functioning and development of national innovation system.

**Table 2**

### Main directions of modern innovation policy of foreign countries.

Direction of innovation policy	Specifics	Countries
Optimization of the structure of the national innovation system	Optimization of the system of state management and planning in the field of innovation	Japan, Norway, India, Chile
	Optimization of public funding of science and innovation sphere	USA, France, Great Britain, Denmark, Norway, Sweden,
	Development of basic researches	Great Britain, Sweden, Slovenia
Stimulation of innovation cooperation of business and science (universities) in the country	Promoting symmetrical convergence of universities and corporations	USA, Finland
	Large public investments in science and innovation and attraction of national private capital	Israel, Finland
	Stimulation of innovative activity of the private sector with the involvement of foreign capital in the innovation sphere	UK, Ireland, China, Korea, Malaysia, India, Israel
	Stimulation of innovative initiatives of research sector	Germany, Japan, New Zealand, Denmark
Integration into international innovation networks	Complex integration	Finland, Israel, the Netherlands, China
	technological specialization	Korea, Malaysia, Singapore, Taiwan, India
Establishing internal innovation networks	Creating special conditions for the formation of relationships in the sphere of innovation	United States, Norway, Ireland
	Stimulating initiatives of national regions	France, Germany, Finland
The formation of the national innovation system	The restructuring of the state sector of science	Bulgaria, Poland, Lithuania
	Initiation of the integration of science and education	Latvia, Estonia, Czech Republic
	The involvement of small and medium-sized businesses in the innovation sphere	Romania, Czech Republic, Slovakia, Latvia, Estonia, Turkey, Chile
	Identification of priority directions in the field of export of high technology	Czech Republic, Romania, Chile, Turkey

Initially, the authors of this article have formulated following functions of national innovation system:

- legal – system provides following established by the state rules and regulations in the

field of innovation, as well as feedback to improve the regulatory framework;

- resource - creating conditions for an optimal allocation of natural, production, human and social resources among all subjects of innovation activity. Tangible and intangible resources are the basis of

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innovative activities within the national economic system;

- function of knowledge management - the creation of conditions for the creation, transmission and storage of knowledge - creative foundation for innovation as the creation of specific activities that are unique to humans. Mediated by the action of this function is the development of human capital as the main carrier of knowledge;

- information - support and development of processes of storage, transmission and processing of information both inside the system (between the individual components, subsystems and system state as a whole), and in cooperation with national innovation system with environment (external environment, global level of development of science and technology, conditions in international processes);

- organizational - the development of forms and structures of institutions and organizations, mechanisms of their interaction, cooperation and coordination. This feature is aimed at developing diversity elements of the national innovation system and the expansion of intra-relationships;

- function of competitiveness - providing such state of economic, technological, organizational and structural efficiency, which allows the national innovation system to be competitive in the global innovation system. This ensures active cooperation of the national innovation system with the environment, aimed at a specific result;

- function of dynamic self-organization and development – determined by flowing innovative processes within the system, in particular organizational innovation, focused on the development and evolution in changing environment due to the accumulation of internal capacity. The innovative nature of flowing processes occurring in the NIS requires constant adaptation.

Analysis of the above functions as well as functions of the national innovation system, allocated by Russian scientists, and detailed study of the theory of systems changed the views of the authors.

### *Exterior features of the national innovation system*

Transformative function is inherent to creative systems such as national innovation system is to convert the environment, bringing it into conformity with its essence. Transformative function of the national innovation system is manifested in the preservation and increase in value and structural terms of intangible capital of the national wealth.

Consumer function is connected to the input (production) and output (consumption) of innovative products (goods, services) and is manifested through the process of innovation, or innovation activity. For the production of innovative products it is necessary to find and "grow" an innovative product (goods, services) of entrepreneur/enterprise (company),

branch etc. Consumption is manifested through the finance/investment, human resources, environment infrastructure etc. On the output there should be subjects of consumption of innovative products (goods, services).

Function of absorption of the national innovation system is manifested in its relation to the supranational innovation system and the global innovation system. Companies are looking for a more favorable environment for their production around the world, according to the "new theory of international trade" and "new economic geography" by P. Krugman. Function of absorption is most clearly manifested through technological trajectory of the environment, social and network interaction, international trade agreements, international investment agreements, etc.

The adaptive function ensures coordination of the system with its environment, mutual change in behavior. In the particular case there is reference to "innovative person". National innovation system must contribute to the empowerment of people through voluntary action for innovation, innovation activity (bring the knowledge of "what, how, why"), and the person should be interested in innovation, innovation activity ("to know and participate").

As the academician of Russian Academy of Science A. I. Tatarkin mentions, "fundamental changes in social and economic system during the reforms have led to a radical transformation of the conditions of occurrence of motivational processes. A significant part of enterprises increasingly focused on a strategy of coercion, using a strong for current stage negative motive of dismissal or unemployment"[35. 10-17 pp].

Serving function of the national innovation system is shown in its top-level hierarchy as compared with:

- classification of the geography of innovation - regional, inter-regional and local innovation systems;
- functional and process classification innovation;
- classification of high-tech and knowledge intensive products (goods, services).

"The most important role of internal features is that they provide the necessary, for the functioning of the external system, internal dynamics" [34].

### **Internal functions of the national innovation system**

The monitoring function is shown in qualitative and quantitative assessment and consideration of the results of the national innovation system:

- comparison of the actual status with the objectives (recognition of epochal, basis, improving innovation and pseudo-innovative);

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- verification of compliance with the declared (control) and carried out (supervision) activities established by legislative and other normative legal requirements;

- avoiding the establishment of monopolistic dictate of some market participants over others.

The function of coordination and harmonization is manifested in:

- coordinated joint actions of all components of the national innovation system, from the idea of an innovative product (good, services) to the commercialization of the product (good, services);

- horizontal ordering of components of the national innovation system.

Function of coordination dominates in the subject-subject and object-object interactions.

Organizational-administrative function lies in:

- consolidation of elements and subsystems of the national innovation system of specific action of a functional in a clearly defined sequence;

- adoption of specific decisions on individual objects of the national innovation system;

- regulation of activity, that allows managing body to fulfill its goals and objectives.

The function of subordination (from the latin. subordinate - collateral subordination) and reordination (from the latin. reordination - reassignment) includes:

- vertical ordering of the system, where one of the constituent elements play a leading role, defining the beginning in the work of others;

- management processes in the interaction;

- legal subordination of parts or elements of a community over others, both horizontally and vertically.

Function of subordination dominates the subject-object and object-subject relationship.

Function of allocation - efficient allocation of factors of production in areas where their use will provide the greatest return.

Thus, on the basis of the conducted study purposeful analytical definition of the concept "national innovation system" was presented. Proposed definition of the national innovation system:

1) takes into account the fundamental components of the concept of national innovation system: theory of firm, innovation theory, theory of knowledge management, theory of systems, theory of institutionalism, theory of national wealth, theory of national economy;

2) marked complexity, openness and dynamism of the national innovation system;

3) pointed out how to use the subject of investigation in order to achieve any purpose, what are the functions performed based on.

Separation of internal and external environment of the national innovation system has allowed to formulate and justify its internal and external functions. Exterior features of the national innovation system: converting, consuming, absorbing, adaptive, serving. Internal functions of the national innovation system: controlling, coordinating and harmonizing, organizational and administrative, subordinating and reordinating, allocating.

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SOI: [1.1/TAS](#) DOI: [10.15863/TAS](#)

## International Scientific Journal Theoretical & Applied Science

p-ISSN: 2308-4944 (print) e-ISSN: 2409-0085 (online)

Year: 2016 Issue: 1 Volume: 33

Published: 30.01.2016 <http://T-Science.org>

### SECTION 7. Mechanics and machine construction.

**Mukatay Nemerebayev**  
doctor of technical Sciences, Professor,  
Taraz innovation and humanities University, Kazakhstan  
[nemerebayev@mail.ru](mailto:nemerebayev@mail.ru)

**Murat Musabekovich Bekmuratov**  
Candidate of technical sciences, associate Professor,  
Taraz state University named after M.Kh. Dulati,  
Kazakhstan

**Seitzhan Orynbayev**  
PhD, associate Professor,  
Taraz state University named after M.Kh. Dulati,  
Kazakhstan  
[seitzhan\\_74@mail.ru](mailto:seitzhan_74@mail.ru)

**Aigerim Nemerebayeva**  
Master of Laws,  
Taraz innovation and humanities University, Kazakhstan

## EFFECT OF SHEAR DEFORMATION ON FREE VIBRATION OF CYLINDRICAL COMPOSITE NETLIKE SHELLS

**Abstract:** This paper describes the effect of shear deformation on free vibration of composite netlike cylindrical shell.

Using “additional” forces  $N_{ii}$ ,  $N_{ij}$  at critical deviation equilibrium of shell in the linear equation, derived from technical theory, and displacement fields  $u, v$ , and  $w$ , defining the relative deformation, derived the limited equation of free vibration of netlike cylindrical shells.

Also based on proven theory of S.A.Ambartsumyan and using displacement fields  $u, v$ , and  $w$  derived the equation for free vibration frequency of netlike cylindrical shell with the effect of shear deformation.

The relative difference  $\delta(m, n)$  of the two vibration frequency equations at constant  $n=3, n=10$  was plotted against increasing  $m$  and it was proven that the difference increases with the effect of shear deformation.

**Key words:** vibration, deformation, frequency, shell.

**Language:** English

**Citation:** Nemerebayev M, Bekmuratov MM, Orynbayev S, Nemerebayeva A (2016) EFFECT OF SHEAR DEFORMATION ON FREE VIBRATION OF CYLINDRICAL COMPOSITE NETLIKE SHELLS. ISJ Theoretical & Applied Science, 01 (33): 86-90.

**Soi:** <http://s-o-i.org/1.1/TAS-01-33-17> **Doi:**  <http://dx.doi.org/10.15863/TAS.2016.01.33.17>

### 1. Introduction.

One of the problems of used shell theories based on Kirchoff-Love kinematical model is that it does not account for shear deformation. This factor effects determining the vibration frequency and critical static force, thus there is no need to prove that it will have its impact when solving complex dynamic problems. This paper describes the use of technical theory based on Kirchoff-Love kinematical model on composite cylindrical netlike shells.

Nowadays when solving problems of plates and shells taking into account shear deformation, the linear theory of cross-sectional tangent deflections of structures (The Timoshenko kinematic model) and the theory based on parabolic shear stress on cross-section are mostly used [1, 2, 3].

Analyzing the papers describing the determination the frequency of free vibration using the shear deflection and rotatory inertia of isotropic cylindrical shells Greenberg et al [4] points on a problem of determining the free vibration frequency of anisotropic shells especially the effect of shear deformation on shell with low shear module.

### 2. The method to account for the effect of shear deformation on free vibration of composite netlike cylindrical shell.

From the technical theory we can derive the following linear equations for netlike cylindrical shell.

$$\frac{\partial N_{11}}{\partial x} + \frac{\partial N_{21}}{\partial y} + P_1 + X_1 = 0,$$



$$\begin{aligned} \frac{\partial N_{22}}{\partial y} + \frac{\partial N_{12}}{\partial x} + P_2 + X_2 &= 0, \\ \frac{\partial N_{13}}{\partial x} + \frac{\partial N_{23}}{\partial y} - \frac{N_{22}}{R} + P_3 + X_3 &= 0, \quad (1) \\ \frac{\partial M_H}{\partial x} + \frac{\partial M_{21}}{\partial y} - N_{13} + \Phi_2 + F_2 &= 0, \\ \frac{\partial M_{22}}{\partial y} + \frac{\partial M_{12}}{\partial x} - N_{23} + \varphi_1 + F_1 &= 0, \end{aligned}$$

here:  $N_{ij}$  are the “additional” forces at critical deviation equilibrium of shell, and under the technical theory will take the following values.

$$\begin{aligned} N_{11} &= C_{11}\varepsilon_1 + C_{12}\varepsilon_2, \\ N_{22} &= C_{22}\varepsilon_2 + C_{12}\varepsilon_1, \\ N_{12} &= N_{21} = C_{66}\varepsilon_{12}, \\ N_{13} &= C_{13}(\theta_1 + \gamma_2), \\ N_{23} &= C_{23}(\theta_2 + \gamma_y), \\ M_{11} &= D_{11}x_1 + D_{12}x_2, \end{aligned} \quad (2)$$

$$\begin{aligned} C_{11} &= \frac{\partial^2 u}{\partial x^2} + C_{66} \frac{\partial^2 u}{\partial y^2} + (C_{12} + C_{66}) \frac{\partial^2 v}{\partial x \partial y} + \frac{c_{12}}{R} \frac{\partial \omega}{\partial x} = \frac{2\rho h \delta}{a} \left( \frac{\partial^2 u}{\partial t} + \frac{h^2 \delta^2}{3a^2 R} \frac{\partial^2 \gamma_x}{\partial t^2} \right); \\ (C_{12} + C_{66}) \frac{\partial^2 u}{\partial x \partial y} + C_{22} \frac{\partial^2 v}{\partial y^2} + C_{66} \frac{\partial^2 v}{\partial x^2} + \frac{C_{22}}{R} \frac{\partial \omega}{\partial y} &= \frac{2\rho h \delta}{a} \left( \frac{\partial^2 u}{\partial t} + \frac{h^2 \delta^2}{3a^2 R} \frac{\partial^2 \gamma_x}{\partial t^2} \right); \\ C_{13} \frac{\partial^2 \omega}{\partial x^2} + C_{23} \frac{\partial^2 \omega}{\partial y^2} - \frac{C_{22}}{R} \omega - \frac{C_{12}}{R} \frac{\partial u}{\partial x} - \frac{C_{22}}{R} \frac{\partial \vartheta}{\partial y} + C_{13} \frac{\partial \gamma_x}{\partial x} + C_{23} \frac{\partial \gamma_y}{\partial y} &= \frac{2\rho h \delta}{a} \frac{\partial^2 \omega}{\partial t^2}; \quad (5) \\ D_{11} \frac{\partial^2 \gamma_x}{\partial x^2} + D_{66} \frac{\partial^2 \gamma_x}{\partial y^2} - C_{13} \gamma_x + (D_{12} + D_{66}) \frac{\partial^2 \gamma_y}{\partial x \partial y} - C_{13} \frac{\partial \omega}{\partial x} &= \frac{2\rho h^3 \delta^3}{3a^3} \left( \frac{\partial^2 \gamma_x}{\partial t^2} + \frac{1}{R} \frac{\partial^2 u}{\partial t^2} \right); \\ D_{22} \frac{\partial^2 \gamma_y}{\partial y^2} + D_{66} \frac{\partial^2 \gamma_y}{\partial x^2} - C_{23} \gamma_y + (D_{12} + D_{66}) \frac{\partial^2 \gamma_x}{\partial x \partial y} - C_{33} \frac{\partial \omega}{\partial y} &= \frac{2\rho h^3 \delta^3}{3a^3} \left( \frac{\partial^2 \gamma_y}{\partial t^2} + \frac{1}{R} \frac{\partial^2 \vartheta}{\partial t^2} \right). \end{aligned}$$

Assuming that the shell is in free connection with two sides, and at  $x=0$  values it is satisfied with finite conditions  $N=0$   $\mathcal{G}=0$   $\omega=0$

$M_{22} = D_{22}x_2 + D_{12}x_1$ ,  
 $M_{12} = M_{21} = D_{66}(\tau_1 + \tau_2)$ .  
 The relative deformations in the equation with the help of displacement fields  $u, v$  and  $w$  are defined as follows:

$$\begin{aligned} \varepsilon_1 &= \frac{\partial u}{\partial x}; \varepsilon_2 = \frac{\partial v}{\partial y} + \frac{w}{R}, \\ \gamma_1 &= \frac{\partial v}{\partial x}; \gamma_2 = \frac{\partial u}{\partial y}, \quad (3) \\ \theta_1 &= \frac{\partial w}{\partial x}; \theta_2 = \frac{\partial w}{\partial y}. \end{aligned}$$

$x_1 = \frac{\partial \gamma_x}{\partial x}; x_2 = \frac{\partial \gamma_y}{\partial y}; \tau_1 = \frac{\partial \gamma_y}{\partial x}; \tau_2 = \frac{\partial \gamma_x}{\partial y}$ . (4)  
 Putting equations (2), (3) and (4) into equation (1) we will get the equation for free vibration of the shell.

$M_x = 0$ , and putting the unknowns  $u, \mathcal{G}, \omega$  and  $\gamma_x, \gamma_y$  into Fourier series we get:

$$\begin{aligned} U(x, y, t) &= \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} [U_{mn}(t) \cos \beta_n y + U'_{mn}(t) \sin \beta_n y] \cos \alpha_m x; \\ \mathcal{G}(x, y, t) &= \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} [V_{mn}(t) \sin \beta_n y - V'_{mn}(t) \cos \beta_n y] \sin \alpha_m x; \\ \omega(x, y, t) &= \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} [W_{mn}(t) \cos \beta_n y - W'_{mn}(t) \sin \beta_n y] \sin \alpha_m x; \quad (6) \end{aligned}$$

$$\gamma_x(x, y, t) = \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} [x_{mn}(t) \cos \beta_n y + x'_{mn}(t) \sin \beta_n y] \cos \alpha_m x;$$

$$\gamma_y(x, y, t) = \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} [Y_{mn}(t) \sin \beta_n y - Y'_{mn}(t) \cos \beta_n y] \sin \alpha_m x.$$

here  $\alpha_m = \frac{\pi m}{L}, \beta_n = \frac{n}{R}$ .

Putting equation (6) into equation (5) and by using two similar  $U_{mn}, V_{mn}, W_{mn}, X_{mn}, Y_{mn}$  and  $U'_{mn}, V'_{mn}, W'_{mn}, X'_{mn}, Y'_{mn}$  unknowns we get the series of equations, we write the first five differential equations in matrix form.

$$M \frac{d^2 f_{mn}}{dt^2} + G_{mn} f_{mn} = 0. \quad (7)$$

Here  $f_{mn} = \{U_{mn}, V_{mn}, W_{mn}, X_{mn}, Y_{mn}\}$  and  $G_{mn}, \tilde{M}$  are next symmetric matrixes not equal to zero:

$$g_{mn}^{11} = \alpha_m^2 C_n + \beta_n^2 C_{66};$$

$$g_{mn}^{22} = -\alpha_m \beta_n (C_{12} + C_{66});$$

$$g_{mn}^{13} = -\frac{C_{12}}{R} dm;$$

$$g_{mn}^{22} = \alpha_m^2 C_{66} + \beta_n^2 C_{22};$$

$$g_{mn}^{23} = \frac{C_{22}}{R} \beta_n;$$

$$g_{mn}^{33} = \frac{C_{22}}{R^2 m} + C_{13} \alpha_m^2 + C_{23} \beta_n^2;$$

$$g_{mn}^{34} = C_{13} \alpha_m;$$

$$g_{mn}^{35} = -C_{23} \beta_n;$$

$$g_{mn}^{44} = \alpha_m^2 D_{11} + \beta_n^2 D_{66} + C_{13};$$

$$g_{mn}^{45} = -\alpha_m \beta_n (D_{12} + D_{66});$$

$$m_{11} = m_{22} = m_{33} = \frac{2\rho h \delta}{a};$$

$$m_{44} = m_{55} = \frac{2\rho h^3 \delta^3}{3a^3};$$

$$m_{14} = m_{25} = \frac{2\rho h^3 \delta^3}{3a^3 R}.$$

Analyzing the effect of shear deformation on vibration frequency at bending vibration conditions in literature, and using equation (5) we get the known equation

$$\frac{d^2 W_{mn}}{dt^2} + \omega_{mn}^2 W_{mn} = 0. \quad (8)$$

Here  $\omega^2$  value as per [5] determined as follows:

$$\omega_{mn}^2 = \frac{a}{2\rho h \delta} \left[ \frac{\alpha_m^4 C_{66} (C_{11} C_{22} - C_{12}^2) + \frac{K_{mn}}{B_{mn}}}{\Delta_{mn}} \right]; \quad (9)$$

$$\Delta_{mn} = R^2 \left[ \alpha_m^4 C_{11} C_{66} + \beta_n^4 C_{22} C_{66} + \alpha_m^2 \beta_n^2 (C_{11} C_{22} - C_{12}^2 - 2C_{12} C_{66}) \right]$$

$$K_{mn} = \alpha_m^6 C_{13} D_{11} D_{66} + \alpha_m^4 \beta_n^2 \left[ C_{13} (D_{11} D_{22} - D_{12}^2 - 2D_{12} D_{66}) + C_{23} D_{11} D_{66} \right] +$$

$$\alpha_m^2 \beta_n^4 \left[ C_{13} D_{22} D_{66} + C_{23} (D_{11} D_{22} - D_{12}^2 - 2D_{12} D_{66}) \right] + \beta_n^6 C_{23} D_{22} D_{66} + C_{13} C_{23} \times$$

$$\left[ \alpha_m^4 D_{11} + \beta_n^4 D_{22} + 2\alpha_m^2 \beta_n^2 (D_{12} + 2D_{66}) \right]$$

$$B_{mn} = \alpha_m^4 D_{11} D_{66} + \alpha_m^2 \beta_n^2 (D_{11} D_{22} - D_{12}^2 - 2D_{12} D_{66}) +$$

$$\beta_n^4 D_{22} D_{66} + \alpha_m^2 (C_{13} D_{66} + C_{23} D_{11}) + \beta_n^2 (C_{13} D_{22} + C_{23} D_{66}) + C_{13} C_{23}$$

$C_{ij}$  and  $D_{ij}$  are hardness of shell [6].

If  $C_{13} \rightarrow \infty, C_{23} \rightarrow \infty$  then from equation (8) as per [4] we get below vibration equation based on technical theory:

$$\omega_{mn}^2 = \frac{2}{2\rho h\delta} \left[ \alpha_m^4 D_{11} + 2\alpha_m^2 \beta_n^2 (D_{12} + 2D_{66}) + \beta_n^4 D_{22} + \frac{\alpha_m^4 C_{66} (C_{11} C_{22} - C_{12}^2)}{\Delta_{mn}} \right]. \quad (10)$$

If we use proved equations of S.A. Ambartsumyan we get as a base of analysis the next values of shear stresses

$$\sigma_{13} = \frac{1}{2} \left( \frac{h^2 \delta^2}{a^2} - z^2 \right) \varphi(x, y, t);$$

$$\sigma_{23} = \frac{1}{2} \left( \frac{h^2 \delta^2}{a^2} - z^2 \right) \psi(x, y, t). \quad (11)$$

Based on technical theory we write the displacement and deformation as follows

$$\begin{aligned} u_1 = u + z \left[ -\frac{\partial w}{\partial x} + a_{55} \varphi \left( \frac{h^2 \delta^2}{a^2} - \frac{z^2}{6} \right) \right]; \quad u_2 = v + z \left[ -\frac{\partial w}{\partial y} + a_{44} \psi \left( \frac{h^2 \delta^2}{a^2} - \frac{z^2}{6} \right) \right]; \\ \varepsilon_{11} = \frac{\partial u}{\partial x} + z \left[ -\frac{\partial^2 w}{\partial x^2} + a_{55} \frac{\partial \varphi}{\partial x} \left( \frac{h^2 \delta^2}{a^2} - \frac{z^2}{6} \right) \right]; \\ \varepsilon_{22} = \frac{\partial v}{\partial y} + \frac{w}{R} + z \left[ -\frac{\partial^2 w}{\partial y^2} + a_{44} \frac{\partial \psi}{\partial y} \left( \frac{h^2 \delta^2}{a^2} - \frac{z^2}{6} \right) \right]; \\ \varepsilon_{12} = \frac{\partial u}{\partial y} + \frac{\partial v}{\partial x} + z \left[ -2 \frac{\partial^2 w}{\partial x \partial y} + \left( a_{55} \frac{\partial \varphi}{\partial y} + a_{44} \frac{\partial \psi}{\partial x} \right) \left( \frac{h^2 \delta^2}{a^2} - \frac{z^2}{6} \right) \right]. \end{aligned} \quad (12)$$

Here  $a_{55} = \frac{1}{G_{13}}$ ,  $a_{44} = \frac{1}{G_{23}}$ ,  $G_{i3}$ - shear module.

The intersecting forces and momentums values are defined as follows:

$$\begin{aligned} N_{13} = \frac{2(hb)^3}{3a^3} \varphi; \quad N_{23} = \frac{2(hb)^3}{3a^3} \psi; \\ M_{11} = D_{11} \frac{\partial}{\partial x} \left( -\frac{\partial w}{\partial x} + a_{55} \frac{2(hb)^2}{5a^2} \varphi \right) + D_{12} \frac{\partial}{\partial y} \left( -\frac{\partial w}{\partial y} + a_{44} \frac{2(4b)^2}{5a^2} \varphi \right); \\ M_{22} = D_{12} \frac{\partial}{\partial x} \left( -\frac{\partial w}{\partial x} + a_{55} \frac{2(hb)^2}{5a^2} \varphi \right) + D_{22} \frac{\partial}{\partial y} \left( -\frac{\partial w}{\partial y} + a_{44} \frac{2(hb)^2}{5a^2} \varphi \right); \\ M_{12} = M_{21} = D_{66} \left( \frac{\partial}{\partial x} \left( -\frac{\partial w}{\partial y} + a_{44} \frac{2(4b)^2}{5a^2} \varphi \right) + \frac{\partial}{\partial y} \left( -\frac{\partial w}{\partial x} + a_{55} \frac{2(4b)^2}{5a^2} \varphi \right) \right). \end{aligned} \quad (13)$$

The movement equation of the shell is described with unknowns  $u, v, w, \varphi$ , thus putting the values of intersecting forces and momentums from equation (13) to equation (1), and also considering the values of

$$\begin{aligned} X_x = \frac{\partial w}{\partial x} + a_{55} \frac{2(4b)^2}{5a^2} \varphi; \\ \gamma_y = -\frac{\partial w}{\partial y} + a_{44} \frac{2(4b)^2}{5a^2} \varphi \text{ and} \\ C_{13} = K^1 \frac{2hb}{a} G_{13} \end{aligned}$$

$$G_{23} = K^{11} \frac{2hb}{a} G_{23}$$

$$K^1 = K^{11} = \frac{5}{6} \text{ we get the equation (9).}$$

This means that the equation taken as per proven theory of S.A. Ambartsumyan is derived as per above equation (9) of netlike shell. If comparing the  $(\omega_{mn})$  values of above equation (9) with equation (10), then the relative difference will be the

$$\text{difference of } \delta_{(mn)} = \frac{\omega_{mn}^{(1)}}{\omega_{mn}^{(10)}} - 1 \text{ values.}$$



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When  $R=1$ ,  $L/R=2$  and because  $m$  and  $L$  values are in combination of  $\frac{\pi m R}{L}$  we can analyze the change of  $m$  while  $1/L$  is constant, or vice versa.

Putting the equation into program we can see that at  $n=3$ ,  $n=10$  and  $G_{12}/G_{13}=1$ ,  $\delta$  increases.

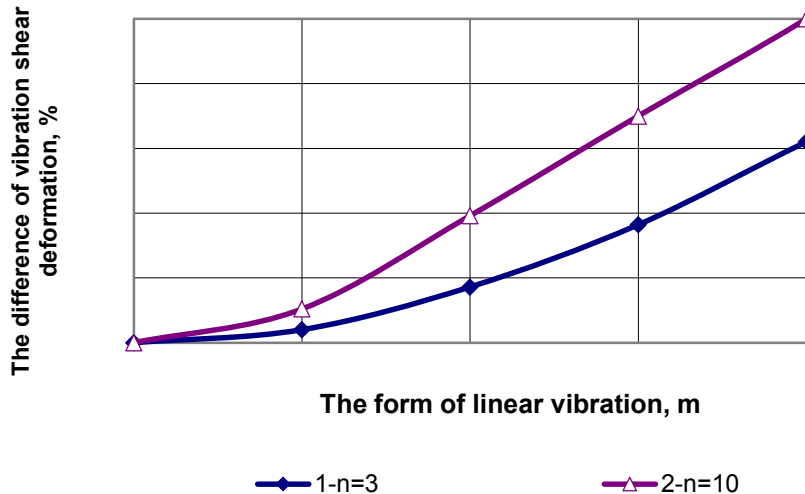


Figure 1 –The graph of changing the difference of vibration using shear deformation, where  $n=3$ ,  $n=10$ , from  $m$ .

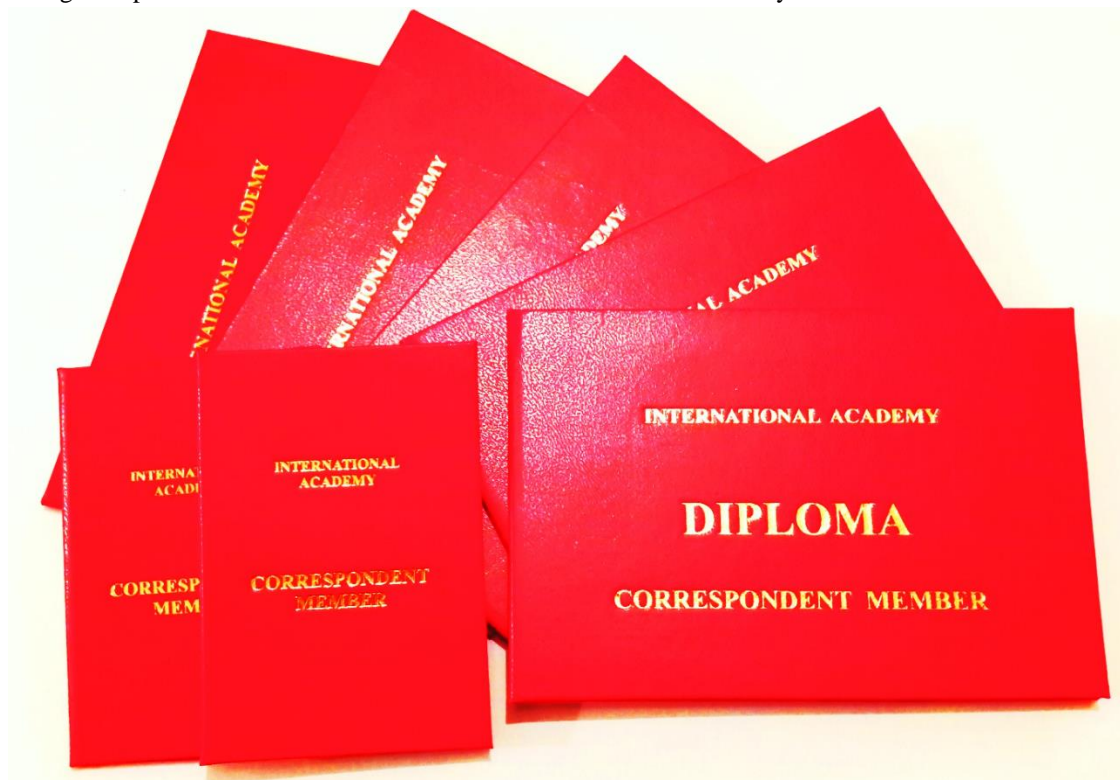
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According to the results of research work of the past 2015 and published scientific articles in the journal «Theoretical & Applied Science», Presidium of International Academy of Theoretical & Applied Sciences has decided to award the following scientists - rank Corresponding member and Academician of International Academy, as well as give diplomas and certificates of member of International Academy.



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### Научное издание

«Theoretical & Applied Science» - Международный научный журнал зарегистрированный во Франции, и выходящий в формате Международных научно-практических интернет конференций. Конференции проводятся ежемесячно – 30 числа в разных городах и странах.

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