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BOOK OF ABSTRACTS

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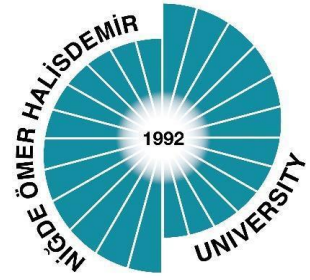
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Prof. Dr. Murat BARUT

Res. Asst. Alper ECEMIS

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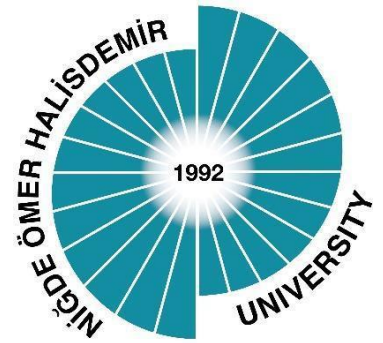
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**INFORMATION AND TELECOMMUNICATION
TECHNOLOGIES, MATHEMATICS:**

**Industry 4.0, Internet of Things, Artificial
Intelligence, Machine Learning, Mathematics**

Bir otomobil araç modeli etrafındaki 3 boyutlu akış yapısının ve aerodinamik direnç kuvvetinin incelenmesi

¹Cihan BAYINDIRLI, ²Mehmet ÇELİK

¹Niğde Ömer Halisdemir Üniversitesi, Teknik Bilimler Meslek Yüksekokulu, Motorlu Araçlar ve Ulaştırma Teknolojileri Bölümü, Niğde, Türkiye

²Karabük Üniversitesi, Mühendislik Fakültesi Makine Mühendisliği Otomotiv ABD, Karabük, Türkiye

cbayindirli@ohu.edu.tr, mehcelik@karabuk.edu.tr

Özet: Taşıtlara etki eden kuvvet ve momentlerin deneysel ve numerik yöntemle tespit edilmesi ve uygun tasarımların belirlenmesi aerodinamiğin temel konusudur. Her iki yöntemde taşıtın prototipini gerçek boyutlarında üretmeden hızlı, kolay ve düşük maliyetle aracın aerodinamik karakteristiğini belirlemek oldukça avantajlıdır. Taşıtların aerodinamik yapılarının yakıt tüketimi, performans, ivmelenme, yol tutuş özellikleri, emisyon değerleri, soğutma sistemi, havalandırma sistemi, fren sistemi, araç etrafındaki hava akışından kaynaklanan gürültü miktarı gibi birçok parametre üzerinde etkisi vardır. Bu çalışmada, SolidWorks® programında tasarlanan 1/20 ölçekli bir otomobil modeline etki eden sürüklenme kuvveti ve araç etrafındaki 3 boyutlu akış yapısı hesaplamalı akışkanlar dinamiği (HAD) yöntemi ile incelenmiştir. Akış analizleri Ansys Fluent CFD yazılımında k-ε türbülans modeli kullanılarak 20 m/s, 30 m/s, 40 m/s ve 50 m/s serbest akış hızlarında gerçekleştirilmiştir. Akış analizleri dinamik benzerlik şartının sağlanabildiği 2.96×10^5 - 7.4×10^5 Reynolds sayısı aralığında gerçekleştirilmiştir. Kinematik benzerlik için blokaj oranı %4.06'dır. Model aracın aerodinamik direnç katsayısı ortalama 0.414 olarak hesaplanmıştır. Toplam sürüklenme kuvvetinin %86.69'u basınç kaynaklı, %13.31'nin ise sürtünme kaynaklı olduğu belirlenmiştir. Model araç gövdesi üzerinde akış ayrılmaları, basınç dağılımları ve basınç kaynaklı direncin yüksek olduğu bölgeler 3 boyutlu akış görüntülemeleri ile tespit edilmiştir.

Anahtar Kelimeler: C_D katsayısı, Aerodinamik, Ansys-Fluent®, CFD, Sürüklenme kuvveti, Dış akış

Essay writing and its problems: a study of engineering students at undergraduate level

¹Waheed Shahzad, ²Muhammad Anwar Farooq, ³Majid Rashid

^{1,2,3}Department of Humanities and Social Sciences

Fhwaja Fareed University of Engineering and Information Technology Rahim Yar Khan

waheed.shahzad@kfueit.edu.pk, anwar.farooq@kfueit.edu.pk, majid.rashid@kfueit.edu.pk

Abstract: Writing is the most important genre of all four modules of language. In Pakistan, English is taught as a second language and developing English writing competence is essential for successful communication at all levels of the education system. However, students face challenges in mastering English essay writing skills. The main objective of this study is to investigate the challenges faced in English essay writing by engineering students at undergraduate level in Khwaja Fareed UEIT Rahim Yar Khan Pakistan. However, the specific objectives were to determine strategies employed by teachers for teaching essay writing skills, problems faced and strategies employed by students for learning these skills. Finally, methods were proposed for teachers and students for enhancing English essay writing skills among students. A descriptive survey research methodology was adopted. The researcher has selected the mixed method approach for conducting this research keeping in view different consideration. It includes the mixing of quantitative and qualitative methods. The target population was teachers and students of public sector engineering universities. The sample consisted of 170 students and 27 teachers from 17 sampled universities. Questionnaire from teachers and students and an essay writing test from students were conducted to collect data. The descriptive statistical technique was used to analyze quantitative data in the form of percentages and frequencies. It was evaluated that most common teaching methods used are demonstrations, lectures and question and answers. Based on the findings, lecture, question, and answers, reading aloud and demonstrations are the most common teaching techniques used by teachers. All these conventional methods promote rote learning and hinder creative writing capabilities of students. Moreover, teachers focus on correct use of grammar rather than developing mastery over content and organization of ideas. Methods like role play, peer teaching, group discussions, and oral presentations are given less importance in teaching writing skills. Based on the study, recommendations were made for students, teachers, and government to address the challenges students face in English essay writing at undergraduate level.

Keywords: Engineering students, English essay writing, ESL

Elektrikli ve hibrit elektrikli araçlarda enerji yönetim sistemleri, elektrik motoru ve batarya teknolojileri

¹Mehmet ÇELİK, ²Cihan BAYINDIRLI

¹Karabük Üniversitesi, Mühendislik Fakültesi Makine Mühendisliği Otomotiv ABD, Karabük,
Türkiye

²Niğde Ömer Halisdemir Üniversitesi, Niğde Teknik Bilimler Meslek Yüksekokulu, Motorlu
Araçlar ve Ulaştırma Teknolojileri Bölümü, Niğde, Türkiye
mehcelik@karabuk.edu.tr, cbayindirli@ohu.edu.tr

Özet: Elektrikli araçlar, 20. yüzyılın başlarında yaygın olarak kullanılmaktaydı. İçten yanmalı motor teknolojilerindeki gelişmeler, büyüyen petrol altyapısı, içten yanmalı motorların seri üretimine bağlı fiyatlarındaki düşüş elektrikli araçların kullanımını azaltmıştır. Fakat son yıllarda elektrikli araçlar; araç yakıt ekonomisinin iyileştirilmesi, çevresel bozulma ve enerjideki kısa vadeli problemleri çözmenin umut verici bir yolu haline gelmiştir. Ulaştırma sektöründe kullanılan fosil yakıtlı araçlar sera gazı emisyonlarının %25'ini oluşturmaktadır. Elektrikli sürüş sistemi ve hibrit elektrikli sürüş sistemi, yolcu taşıtlarında ve hafif hizmet araçlarında yaygın olarak kullanılmaktadır. Son yıllarda otomobil üreticileri ve özel şirketler elektrikli araçlar konusunda ciddi çabalar harcamaktadır. Oluşan bu eğilimlerden dolayı, elektrikli araçların yakın gelecekte içten yanmalı motorların yerini alması muhtemeldir. Elektrikli araçlar çevre, güç sistemi ve diğer ilgili sektörler üzerinde önemli etkilere neden olabilir. Elektrikli araçların yaygınlaşmasında pil teknolojisindeki gelişmeler etkileyici olmuştur. Günümüzde kullanılan geliştirilmiş motor ve pil teknolojileri sayesinde elektrikli araçlar daha fazla menzile sahiptirler. Çeşitli enerji kaynaklarını ve güç aktarma organlarını en uygun şekilde birleştirerek, doğru ve sağlam bir güç yönetimi kontrol algoritması gerçekleştirerek, çevremizi korurken ve sınırlı kaynaklarımızı akıllıca kullanarak güvenilir ve daha uygun fiyatlı elektrikli araç üretmek mümkün olacaktır. Bu çalışmada elektrikli araçların daha kullanılabilir hale getirilmesi için yeni teknoloji yönetim sistemleri, elektrik motorları ve batarya teknolojilerinden bahsedilmektedir.

Anahtar Kelimeler: Elektrikli araçlar, Hibrit araçlar, Elektrik motorları, Enerji yönetim sistemi, Bataryalar

Tek tesirli civatalı bağlantılarda delik toleransı deęişiminin bağlantı dayanımına etkisinin sayısal olarak incelenmesi

İsmail Saraç

**Aksaray Üniversitesi Mühendislik Fakültesi Makine Mühendisliği Bölümü
ismailsarac@aksaray.edu.tr**

Özet: Civatalı bağlantılarda, birleştirilecek parçalara açılan delikler civata şaftı çapından bir miktar büyük seçilerek, civatanın rahat geçmesi sağlanır. Parçalara açılan delik çaplarının çok hassas toleranslarla belirlenmesi işçilik ve zaman kaybına yol açmaktadır. Bu çalışmada, civata bağlantılı plakalarda, delik toleransı deęişiminin plaka dayanımına etkisi sayısal olarak araştırılmıştır. Sayısal çalışma, lineer-elastik gerilme ve hasar analizi şeklinde gerçekleştirilmiştir. Yapılan çalışma sonucunda, delik toleransının artması plaka dayanımını düşürmüştür. Ancak, tolerans farklılıklarının dayanıma etkisi en fazla %6,3 deęerinde hesaplanmıştır. Hassas tolerans işlemleri gerektiren imalat maliyetlerinin oldukça yüksek olduęu düşünöldüğünde, elde edilen sonuçlara göre toleransları normal seviyelerde tutmanın daha doğru bir yaklaşım olduęu sonucuna varılmıştır.

Anahtar Kelimeler: Civatalı bağlantılar, Delik toleransı, Hasar analizi

An operational matrix method based on Chebyshev polynomials for approximate solutions of systems of higher-order linear Fredholm integro-differential equations

Şuayip Yüzbaşı, Gamze Yıldırım
Akdeniz University
syuzbasi@akdeniz.edu.tr

Abstract:

General information: In this study, an effective algorithm will be created to solve the systems of linear Fredholm integral equation numerically.

Aim: The aim of this study is to obtain the approximate solutions of the systems of linear Fredholm integral equation depending on the first kind shifted Chebyshev polynomials.

Method: The method includes matrix representations of approximate solutions, derivatives and integrals of these approximate solutions, which depend on the Chebyshev series. According to this method, the given problem is reduced to an algebraic system containing Chebyshev coefficients. Finally, the method is applied.

Discoveries: The results are shown in tables and graphs. Accordingly, the approximate solution obtained by the present method is very close to the exact solution.

Result: Thus, by examining the results, it can be said that the method is successful. Also, results are obtained with the codes written in the Matlab program.

Keywords: Chebyshev polynomials, Collocation method, collocation points, Fredholm integro-differential equations

Determination of text relevance to search request with taking into account the grammar of links

¹Sagnayeva S.K., ^{2,3}Yerimbetova A.S., ⁴Sembina G.K., ^{5,6}Murzin F.A., ^{5,6}Batura T.V., ⁷Gudyreva E.M.

¹L.N. Gumilyov Eurasian National University, ²Institute of information and computing technology, MES RK, ³Kazakh Academy of Transport and Communications named after M. Tynyshpayev, ⁴International IT University, Novosibirsk State University, ⁵A.P. Ershov Institute of Informatics Systems Russian Academy of Sciences Siberian Branch, ⁶Kherson Maritime Academy

Sagnaeva_tar@mail.ru, aigerian@mail.ru, sembina_tar@mail.ru, murzin@iis.nsk.su, tatiana.v.batura@gmail.com, gydelena1@ya.ru

Abstract: Methods of automatic natural language analysis (NL) are the most dynamically developing information technologies. Complex theories have appeared about the structure of the text itself and offering to develop algorithms in the direction of semantic analysis. In this work we tried to find a middle ground, limiting ourselves to taking into account certain grammatical relationships in the text.

The AWP (automatic word processing) systems, traditionally distinguish into the five main stages of analysis: graphematic, morphological, fragmentation, syntactic and semantic. The studies are focused on the Kazakh and Russian languages, to cover both the agglutinative and inflectional types of languages. It was noted that when processing texts in the Kazakh language, it can be difficult to clearly separate the stages of morphological, syntactic and semantic analysis, their coherence is observed. This is due to the peculiarities of word formation in languages of such a system. In addition, it is these three stages that cause the greatest difficulties in automation, regardless of language.

In order to improve the version of the Link Gramma Parser (LGP) software system, a communication system for Turkic languages was developed.

While the solving of the problem of constructing algorithms for assessing the relevance of text to a search query, we used the semantic-syntactic relations between sentence words (including in Kazakh and Turkish) obtained at the output of the LGP software system. The testing showed the high efficiency of the proposed algorithm in solving the problem of determining the relevance of the text to the search query.

Keywords: Relationship Grammar, Semantics of Relationship, Relevance, Search Query, LGP

Sezgisel algoritmalarla robot kavrayıcı mekanizmasının optimal tasarımı

Abdullah Elen¹, Cemil Közkurt²

¹Bandırma Onyedli Eylül Üniversitesi, Mühendislik ve Doğa Bilimleri Fakültesi, Yazılım
Mühendisliği, Bandırma, Balıkesir/TÜRKİYE

²Bandırma Onyedli Eylül Üniversitesi, Mühendislik ve Doğa Bilimleri Fakültesi, Ulaştırma
Mühendisliği, Bandırma, Balıkesir/TÜRKİYE
aelen@bandirma.edu.tr, ckozokurt@bandirma.edu.tr

Özet: Doğal fenomenlerin davranışından esinlenerek tasarlanan optimizasyon algoritmaları, araştırmacıların bilimsel hesaplama ve mühendislik alanları için kullandıkları en popüler yöntemlerden biridir. Global optimizasyon sürecinin sayısız sorunu nedeniyle, bu araştırma alanında yeni algoritmalar her zaman memnuniyetle karşılanmaktadır. Bu çalışmada, literatürde son beş yıl içerisinde önerilen altı farklı sezgisel optimizasyon algoritmasının performansları, robot kavrayıcı tasarımı (RKT) problemi üzerinde ayrıntılı olarak test edilmiştir. Problemin çözümünde her bir algoritma için iterasyon sayısı 500'de sabitlenerek, popülasyon sayıları 10, 25, 50 ve 100 olmak üzere dört farklı şekilde ele alınmıştır.

Anahtar Kelimeler: Sezgisel algoritmalar, Kısıtlı optimizasyon problemi, Robot kavrayıcı tasarımı.

Planet diřli zinciri tasarım probleminin sezgisel optimizasyon yöntemleriyle çözümü

Cemil Közkurt¹, Abdullah Elen²

¹ Bandırma Onyedli Eylül Üniversitesi, Mühendislik ve Doęa Bilimleri Fakültesi, Ulaştırma Mühendislięi, Bandırma, Balıkesir/TÜRKİYE

² Bandırma Onyedli Eylül Üniversitesi, Mühendislik ve Doęa Bilimleri Fakültesi, Yazılım Mühendislięi, Bandırma, Balıkesir/TÜRKİYE
ckozkurt@bandirma.edu.tr , aelen@bandirma.edu.tr

Özet: Yüksek tork iletimi, düşük hacim, düşük elastik deformasyon gibi avantajlara sahip planet diřli zinciri (PDZ) mekanizmaları dięer diřli zincirlere göre daha kompleks bir tasarım sürecine sahiptirler. Bu çalışmada, literatürde son beş yıl içerisinde önerilen bazı sezgisel optimizasyon algoritmalarının performansları, planet diřli zinciri tasarım (PDZT) problemi üzerinde ayrıntılı olarak test edilmiştir. Deneysel çalışmalarda FDB, PFA, CO, STOA, CSA ve VSA olmak üzere altı farklı optimizasyon algoritması kullanılmıştır. Problemin çözümünde her bir algoritma için iterasyon sayısı 500 olarak sabit tutularak, popülasyon sayısı ise 10, 25, 50 ve 100 olmak üzere dört farklı şekilde ele alınmıştır. Elde edilen sonuçlara göre, zaman maliyeti açısından en iyi yöntem CO olmasına rağmen problemin çözümünde dięerlerine göre daha düşük skor elde etmiştir. Bu problemin çözümü için ideal popülasyon değerinin 50 olduğu görülmektedir.

Anahtar Kelimeler: Meta sezgisel algoritmalar, Kısıtlı optimizasyon, Planet diřli zinciri tasarımı.

System of information support of workers of social services of the republic of kazakhstan

¹Sagnayeva S.K., ²Sembina G.K., ¹Zhumadillaeva A.K., ³Gudyreva E.M., ⁴Smailova U.M.

¹L.N. Gumilyov Eurasian National University, ²International IT University, ³Kherson Maritime Academy, ⁴Center for Pedagogical Skills (Nazarbayev Intellectual Schools)
Sagnaeva_tar@mail.ru, sembina_tar@mail.ru, ay8222@mail.ru , gydelena1@ya.ru ,
samilova_tarsu@mail.ru

Abstract: Visual data analysis in an information system is useful when little is known about the data themselves. Due to the fact that the user works directly with the data presented in the form of visual images, he can get additional information to help him make quick decisions. Dispersion analysis was used in the work to divide demographic, medical indicators by regions of Kazakhstan into groups and determine the boundaries of groups when visualizing data on the map. With the help of dispersion analysis, changes in the dispersion of the results of the experiment are determined when the levels of the factor under study change.

Keywords: Information systems, Decision support system, Data analysis, Data visualization, Dispersion

Reconstruction and development of public spaces of the city of Nur-Sultan

Kakenova Gulshat Assylbekovna, Chekayeva Rahima Usmanovna
L.N. Gumilyov Eurasian National University
gkakenova@list.ru

Abstract: This article tells about how the streets were developed, starting with the city of Tselinograd, the capital of Kazakhstan, during the period of virgin lands development, and their influence on the modern appearance of the city during the period of the transfer of the capital of Kazakhstan to Astana (Tselinograd), and now the city of Nur-Sultan, when the priority was cars, public transport and why people's comfort. Goal: to create a safe and comfortable city for pedestrians.

Keywords: Pedestrian safety, "Vision Zero", no barrier pedestrian.

Grade 2nd science teaching students' awareness about stem

Surye İnan¹, Ela Ayşe Köksal¹, Damezhan Sadykova²

¹Niğde Ömer Halisdemir Üniversitesi, ²Kazak Ulusal Kızlar Pedagoji Üniversitesi
surye.inan@hotmail.com

Abstract: This study examines how teacher candidates perceive STEM areas and their STEM awareness, and finally how they perceive the relationships between these areas. In the research, descriptive scanning model, one of the scanning models, was used. Purposeful sampling method was taken into account when determining the sample according to the purpose of the study. The data in the study is to determine how the second grade science teacher candidates who study at Niğde Ömer Halisdemir University, Faculty of Education, Department of Mathematics and Science Education, Science Education Department define STEM fields or how they define the relationship between STEM fields. was collected by a questionnaire developed in the literature. The codes given were determined by examining the answers given to the questionnaires. Themes were created According to the determined codes. There was no content related to STEM in the previous science program. Thanks to the currently renewed program, it was concluded that prospective teachers will have more information about the subject. At the end of the research, it was found that the pre-service teachers discussed science with an interdisciplinary approach and they have an average knowledge of STEM disciplines.

Keywords: STEM Awareness, Science, Technology, Engineering, Mathematics.

Development of criteria for assessing information security based on the research results of security operations centers activities of the republic of kazakhstan

Nurusheva A.M., Sagadat N.B, Satybaldina D.Zh., Nurushev M.Zh.
L.N. Gumilyov Eurasian National University
nurusheva.assel@mail.ru, nurmukhammeds@gmail.com, dinasaty@gmail.com,
nuryshhev@mail.ru

Abstract: The article is devoted to the study of development of criteria for assessing information security based on the research results of Security Operations Centers activities of the Republic of Kazakhstan. Firstly, the authors propose to use some criteria for calculating the effectiveness of the security of the information and communication infrastructure of the enterprises which using services of Security Operations Centers. Secondly, the developed criteria allow companies to subsequently choose the Security Operations Centers that suits them. The results were carried out using an expert method. The analysis was carried out by six experts with over five years of experience and relevant qualifications. The activities of Security Operations Centers have gained high relevance in connection with the exit of workers to a remote form of work.

Keywords: Information, Security, Assessment, System, Criteria

Research of the information and communication infrastructure cyberprotection of the enterprise for the period of remote work (quarantine period)

Nurusheva A.M., Aigisin A.K., Ibrayev Y.M., Seilov S.Zh., Nurushev M.Zh.
L.N. Gumilyov Eurasian National University
nurusheva.assel@mail.ru, aigissinak@gmail.com, yerzhan.i.m@mail.ru, seilov_shzh@enu.kz,
nuryshhev@mail.ru.

Abstract: The article is devoted to the study of the main directions of measures to ensure information security during the period of remote work (quarantine period), the requirements for ensuring the uninterrupted operation of the enterprise infrastructure during the pandemic, and also offers certain recommendations for ensuring an integrated information protection system. Information technologies and information are becoming global in nature and cover all spheres of human life, and as a result, the issues of ensuring information security in the enterprise infrastructure are becoming increasingly relevant. The article analyzes the published incidents in the companies of Kazakhstan and in the whole world during the quarantine period, studied in detail the threats and risks to the information and communication infrastructure of two large national companies that have gone to work. International standards, Kazakh and foreign normative acts in the field of information security have been studied. For the company were developed additional internal documents with information security requirements, the implementation of which allowed to prevent large failures and business processes stop. In a short period of time, employees of various sphere were trained in IT literacy with the aim of ensuring the smooth transition of the company to remote work. The most important requirements for both companies were multi-factor authentication when connecting to a VPN and the updated antivirus program.

Keywords: Information, Security, Cyber, Protection, Remote

Pell-Lucas collocation method and residual error estimation for the Lane–Emden differential equations

¹Şuayip Yüzbaşı, ¹Gamze Yıldırım
¹Akdeniz University
syuzbasi@akdeniz.edu.tr

Abstract:

General information: In this study, an effective algorithm will be created to solve the linear Lane–Emden differential equations with the aid of the Pell-Lucas polynomials numerically.

Aim: The aim of this study is to obtain the approximate solutions of the linear Lane–Emden differential equations depending on the Pell-Lucas polynomials. Also, by means of the residual error function an error problem is constructed and this error problem is solved by using the Pell-Lucas collocation method.

Method: The method includes matrix representations of approximate solutions and derivatives of these approximate solutions, which depend on the Pell-Lucas polynomials. According to this method, the given problem is reduced to an algebraic system containing Pell-Lucas coefficients. Also, we will improve Pell-Lucas approximate solution. Finally, the method is applied.

Discoveries: The results are shown in tables and graphs. When the exact solution of the problem is not known, it can be approximately computed the errors by the Pell-Lucas polynomial solution of the error problem.

Result: Hence, it can be said that the method is successful. It gives better results compared to other methods in the literature. Also, results are obtained with the codes written in the Matlab program.

Keywords: Collocation method, collocation points, Lane–Emden differential equations, Pell-Lucas polynomials

Farklı ışık uygulamalarının patates çeşitlerinin *in vitro* koşullardaki büyümesi ile mini yumru üretim performansı üzerine etkileri

¹Cansu FERHANOĞLU TEKER, ²Mehmet Emin ÇALIŞKAN

¹Eskişehir Tarım ve Orman İl Müdürlüğü, Eskişehir, Türkiye

² Niğde Ömer Halisdemir Üniversitesi, Tarım Bilimleri ve Teknolojileri Fakültesi, Niğde, Türkiye
caliskanme@ohu.edu.tr

Özet: Bu çalışma; (i) doku kültürü ortamında boğum kültürü ile çoğaltımda farklı ışık uygulamalarının dört patates çeşidinin (Agria, Lady Olympia, Fatih ve Ünlenen) *in vitro* koşullardaki büyüme performansına etkileri, (ii) *in vitro* koşullarda farklı ışık uygulamaları altında çoğaltılan dört çeşide ait bitkilerin serada mini yumru üretim performanslarının karşılaştırılması olmak üzere iki aşamada yürütülmüştür. Bu amaçla patates çeşitleri boğum kültürü aşamasında beş farklı ışık uygulamasının altında çoğaltılmıştır: 1) Standart flüoresan lambalarla sağlanan beyaz ışık, 2) LED lambalarla sağlanan mavi ışık (465 nm) , 3) LED lambalarla sağlanan kırmızı ışık (660 nm), 4) LED lambalarla sağlanan mavi (465 nm) ve kırmızı (660 nm) ışığın birlikte uygulanması (%70 kırmızı + %30 mavi), 5) LED lambalarla sağlanan mavi (465 nm), kırmızı (660 nm) ve yeşil (520 nm) ışığın birlikte uygulanması (%70 kırmızı + %20 mavi + %10 yeşil). Boğum kültürü çalışmaları 3 döngü halinde yürütülmüştür. Üçüncü döngü sonunda elde edilen *in vitro* bitkiler serada 2:1 torf:perlit içeren büyütme ortamına dört tekerrürlü olarak ekilerek mini yumru üretim performansları karşılaştırılmıştır.

Çalışmalar sonucunda gerek boğum kültürü aşamasında gerekse de seradaki mini yumru üretim aşamasında patates çeşitlerinin farklı ışık uygulamalarına tepkilerinin farklı olduğu tespit edilmiştir. Denemeye alınan çeşitlerin özellikle kırmızı LED ışık ile kırmızı-mavi-yeşil LED ışık kombinasyonlarına olumlu tepkiler verdiğini, ancak standart beyaz ışığın da gerek boğum kültürü aşamasında gerekse sonraki sera üretiminde tüm çeşitler için kabul edilebilir performansa sahip olduğu görülmüştür. Elde edilen ilk bulgulara göre eğer enerji tasarrufu sağlayacaksa büyütme kabinlerine kırmızı veya kırmızı+mavi+yeşil LED lambaların takılabileceği ancak büyüme performansı açısından LED ışıkların beyaz floresan ışığa göre bariz bir üstünlük yaratmadığı sonucuna varılmıştır. Ancak renkli LED ışıkların bazı çeşitlerdeki olumlu etkileri dikkate alındığında, benzer çalışmaların farklı çeşitlerle tekrarlanması yararlı olacaktır.

Anahtar Kelimeler: Işık rengi, doku kültürü, tohumluk, mini yumru

Actual problems of personnel training for the digital economy: key tasks and factors of success

¹Boris Simak

¹CTU in Prague, FEE. Technicka 2,166 20 Prague.
simak@fel.cvut.cz

Abstract: This paper focuses on current issues in vocational training, key challenges and success factors in the digital economy. Industry and the economy as a whole are undergoing fundamental changes due to the introduction of information technology, cyber-physical and artificial intelligence systems in manufacturing, services and all sectors of the economy. Furthermore, the paper will focus on the changes in vocational education. The changes will be significant especially in the industrial and economic sectors. In addition to new professional knowledge, it is important to motivate and educate workers in the social fields. Lifelong learning will be a necessity. The contribution will be supplemented by trends in education in the EU supported by statistics from EUROSTAT.

Keywords: digital economy, Industry 4.0, profesional training

Overview of Attacks On Wireless Sensor Networks and Experimental Results

E. Mardenov¹, T. Zhukabayeva¹, M. Othman²
L.N. Gumilyov Eurasian National University¹
University Putra Malaysia²
emardenov@gmail.com

Abstract: Wireless sensor networks are a new technology that has a wide range of applications. The location of the WSN does not always allow for security tracking, so the secure connection of nodes is very important. This article provides an overview of WSN attacks, their classification and packet loss rate for a routing attack.

Keywords: Wireless sensor networks, Attacks, Interference in the WSN, Sensor nodes, Security attacks.

Solution of the robot-manipulator workspace approximation problem by the method of interval analysis and its implementation with the python tool

Kamila Tanyrbergenova, Tolkyn Mirgalikyzy
L.N. Gumilyov Eurasian National University
kamila.tanyrbergen@gmail.com

Abstract: The article deals with the workspace of the "two-link" type robot-manipulator. The aim of the research is developing an algorithm of the robot manipulator workspace approximation using interval analysis, modeling and analyzing the results using the Python programming language and tools. The research of the robot manipulator workspace was performed taking into account the imposed restrictions. The algorithm was developed using the Python programming language tools. The results are presented in visual form. The results can be used for practical goals to improve the work of the robot-manipulator working tool when moving on a given working surface.

Keywords: Robot-manipulator, Robot's working space, Robot kinematics, Robot working space approximation.

NATURAL AND APPLIED SCIENCES:

**Life Sciences, Earth Sciences, Biology and
Biotechnology, Chemistry and Environmental
Technologies, Agricultural Sciences &
Technologies, Food Sciences & Technologies**

BIOTECHNOLOGY

Ahmetağa buğday çeşidinde dışsal salisilik asit'in kuraklığa bağlı semptomları azaltmadaki etkileri

¹Bengü Türkyılmaz Ünal, ²Hüseyin Türker*, ³Nebican Kayhan

¹Niğde Ömer Halisdemir University, Department of Electrical and Electronics Eng.(Ariat 10)

²Niğde Ömer Halisdemir University, Department of Electrical and Electronics Eng.

huseyinturker013@gmail.com

Özet: Kuraklık dünyada bitkisel üretimi, dolayısıyla gıda güvenliğini tehdit eden önemli bir abiyotik stres faktörüdür. Salisilik asit ise birçok stres faktörünün etkilerini azaltma ya da ortadan kaldırmada kullanılan bir bitki büyüme düzenleyicidir. Çalışmada kuraklığa karşı hassas bir ekmeklik buğday (*Triticum aestivum* L.) çeşidi olan Ahmetağa'nın kuraklığa karşı verdiği yanıtları ve Salisilik asit'in etkilerini anlayabilmek amacıyla bazı fizyolojik ve biyokimyasal parametreler incelenmiştir. Büyütme odasında torf dolu saksılarda gün aşırı sulanarak 16:8 fotoperiyot, sabit nem (% 50±5) ve 23±2C° sıcaklıkta yetiştirilen üç haftalık buğday fidelerine farklı konsantrasyonlarda polietilen glikol (0,5 ve 1,0 µm PEG), Salisilik asit (0,5 ve 1,0 µm SA) ve bunların karışımları uygulanmıştır. Fideler dört haftalık olduklarında hasat edilerek fotosentetik pigment maddeleri (kla, klb, toplam kl, karotenoid), toplam protein ve malondialdehit (MDA) miktar analizleri yapılmıştır. 0,5 ve 1,0 µm PEG uygulamalarıyla kuraklık stresine maruz bırakılan gruplarda sırasıyla kla (% 37,10; % 37,16), klb (% 36,60; %44,96), toplam kl (% 36,92; % 40,01), karotenoid (% 60,16; % 74,46) miktarları ile toplam protein (% 34,89; % 36,34) miktarında azalma ve MDA miktarında (% 06,31; % 13,50) artma ile 1,0 PEG uygulamasının daha fazla etkili olduğu tespit edilmiştir. Salisilik asitin ise kuraklığın olumsuz etkileri hafiflettiği ve bunda 1,0 µm SA uygulamasının daha başarılı olduğu bulunmuştur.

Anahtar Kelimeler: Karotenoid, Klorofil, MDA, SA, Toplam Protein

Altınbaşak buğday çeşidi üzerine kuraklık ve salisilik asit'in bazı etkileri

¹Bengü Türkyılmaz Ünal*, ²Hüseyin Türker, ³Can Ateş
Niğde Ömer Halisdemir Üniversitesi, Fen Edebiyat Fakültesi, Biyoteknoloji Bölümü
bturkyilmaz@ohu.edu.tr

Özet: Kuraklık stresi dünyadaki tarım alanlarının yaklaşık % 40'ını etkileyen ve gıda güvenliğini tehlikeye atan en önemli abiyotik stres faktörlerinden biridir. Yarı kurak veya kurak yerlerde kuraklık stresine dayanıklılık ya da adaptasyonun artırılması giderek önem kazanmaktadır. Ozmoprotektanların, antioksidan bileşiklerin ya da bitki büyüme düzenleyicilerin bitkilere dışsal olarak uygulanması çeşitli stres faktörlerinin bitkiler üzerindeki olumsuz etkilerini hafifletmede bir çözüm olarak kabul edilmektedir. Salisilik asit (SA), bitkilerde çeşitli fizyolojik süreçlerin düzenlenmesinde rol oynayan bir sinyal molekül ve bitki büyüme düzenleyicidir. Ekmeklik Altınbaşak buğday (*Triticum aestivum* L.) çeşidinin kuraklığa toleransı orta derecede kuvvetlidir. Çalışmada Altınbaşak buğdayın farklı konsantrasyonlarda polietilen glikol (0,5 ve 1,0 µm PEG) kullanılarak oluşturulan kuraklığa karşı tepkilerinin ve kuraklık semptomlarının azaltılmasında yine farklı konsantrasyonlarda Salisilik asit (0,5 ve 1,0 µm SA)'in etkilerinin incelenmesi amaçlanmıştır. Büyütme odasında torf dolu saksılarda 16:8 fotoperiyot, 23±2C° sıcaklık ve sabit nem (% 50±5)'de gün aşırı sulanarak tohumdan yetiştirilen üç haftalık buğday fidelerine, farklı konsantrasyonlarda PEG, SA ve bunların karışımları uygulanmıştır. Fideler dört haftalık olduklarında hasat edilmiş, klorofil a (kla), klorofil b (klb), toplam klorofil, karotenoid, malondialdehit (MDA) ve toplam protein miktar analizleri gerçekleştirilmiştir. Kuraklık stresine maruz kalan uygulama gruplarında konsantrasyona bağlı olarak sırasıyla MDA miktarında (% 02,58; % 06,65) artma; kla (% 19,06; % 37,63), klb (% 23,24; % 38,63), toplam kl (% 20,69; % 38,022), karotenoid (% 7,80; % 23,82) miktarları ile toplam protein (% 17,43; % 26,79) miktarında kontrol grubuna göre azalmalar saptanmıştır. Salisilik asitin ise kuraklığa bağlı zararlanmayı hafifletmede etkili olduğu ve 1,0 µm SA uygulamasının etki derecesinin daha yüksek olduğu belirlenmiştir.

Anahtar Kelimeler: Bitki Büyüme Düzenleyici, Fotosentetik Pigment Maddeleri, Kuraklık Stresi, MDA, Toplam Protein

The efficacy of nature-friendly chemicals eugenol and sodium bicarbonate against post-harvest *Botrytis cinerea* in two pepper cultivars

İsmet YILDIRIM¹, Mustafa SAKALDAŞ²

¹Plant Protection Department, Faculty of Agriculture, Düzce University, Düzce-Türkiye ²Food Processing Department, Lapseki Vocational School, Çanakkale Onsekiz Mart University, Çanakkale-Türkiye
ismetyildirim@duzce.edu.tr

Abstract: Grey mold, caused by *Botrytis cinerea*, is the most important pre-harvest and post-harvest disease of pepper. The disease leads to huge losses in quality and yield of pepper. Synthetic fungicides can not be used because of their harmful residues in the fruits postharvest. Hence, alternative chemicals have gained more importance for human health nowadays. In this study, the postharvest effectiveness of eugenol and sodium bicarbonate (NaHCO₃) to *B. cinerea* were determined on two pepper varieties, Demre and Charleston obtained from pepper fields in Çanakkale. In essay the eugenol was used at dosages of 0.75% and 1.5%, while sodium bicarbonate was used at dosages of 0.5% and 1.0%. Pepper varieties Demre and Charleston showed significantly different sensitivities against grey mold disease ($p < 0.01$), and this case reflected also to the efficacies of alternative chemicals. During eight days of storage, Charleston was more sensitive to *B. cinerea* than Demre. NaHCO₃ at high dosage (1.0%) completely inhibited the disease on Charleston and Demre. The lower dose of NaHCO₃ (i.e. 0.5%) was also highly effective in Demre (providing 95% reduction in the disease) but its efficacy was a little lower for Charleston variety (84%). Efficacy (83.7%) of eugenol at dosage of 1.5% to *B. cinerea* on 'Demre' was found to be similar to that of NaHCO₃ at dosage 0.5% on Charleston. Alternative chemicals had no adverse effects on pepper varieties. It is concluded that both of the tested nature-friendly chemicals (eugenol and sodium bicarbonate) could be used (postharvest) against to *B. cinerea* on peppers.

Keywords : Grey mold, alternative control, postharvest, pepper, Nature-friendly, chemicals.

3D printed porous polycaprolactone (pcl) macrocapsule for protein therapy

Mehmet Ali KARACA^{1,2}, Özgül GÖK³, Cihan TAŞTAN², Derya Dilek KANCAĞI², Ercüment OVALI², Uğur ÖZBEK⁴

¹ Department of Medical Biotechnology, Acibadem Mehmet Ali Aydınlar University

²Acibadem Labcell Cellular Therapy Facility

³ Department of Medical Engineering, Acibadem Mehmet Ali Aydınlar University

⁴Department of Medical Genetics, Acibadem Mehmet Ali Aydınlar University

mehmet.karaca@live.acibadem.edu.tr

Abstract: Current cell therapies induce the immune response after cell transplantation inside body. Immune response inside the patient body degrades the cells which cause decreasing of transplanted cells activity. Immune body response is highly effective to transplanted genetically modified cells when it compared with non-modified cells. Current studies combined the cell therapies with encapsulation technology which protect the cells from environmental immune body responses. Moreover, cells inside capsules can be viable form and capsule can allow the nutrient, oxygen, and growth factor transportation between the environment and inside capsule (Evron et al., 2018). In this study, we designed small size macro-capsule with Autodesk Fusion 360 and printed by using Axolut Bioprinted Dual Print Head System for regeneration of the spinal cord injury. We controlled the permeability and protein release from macro-capsule with Coomassie brilliant blue dye and human serum albumin (HSA). We also control the surface structural morphology of the macro-capsule with SEM images. We obtained porous macro-capsule which allows to controlled protein release.

Keywords: Macro-encapsulation, Cell transplantation, Encapsulation, Protein therapy

Dna mikrodizin analizi ve escherichia coli ile yapılan bazı çalışmalar

Anara Babayeva, Bekir öl, Esra Dibek, Merve Sezer
Muęla Sıtkı Koçman Üniversitesi
anara.babazade@gmail.com

Özet: Transkriptom seviyelerindeki deęişikliklerin tespit edilmesi için Mikrodizin analiz yöntemleri tercih edilmektedir. Çünkü bu teknik aynı anda binlerce genin mRNA seviyelerini deęerlendirmek ve karşılaştırmak için uygun bir yol sağlamaktadır. Mikrodizinler, tipik olarak cam slayt üzerindeki bir ızgarada dizilen "problar" olarak bilinen, kısa nükleotid oligomerlerinden oluşmaktadır. DNA mikrodizin teknięi sırasıyla, çip hazırlanması, örnek hazırlanması, etiketleme, hibridizasyon, tarama ve veri analizi aşamalarını içermektedir.

Bu teknik kullanılarak, Escherichia coli bakterisinin çeşitli stres koşullarına verdiği tepkiler araştırılmıştır. Yapılan bir çalışmada glikoz, gliserol ve asetat ortamında regülasyonu artan ve azalan genler belirlenmiştir. Başka bir çalışmada büyük bir lokusun küresel strese cevapta rol oynadığı belirlenmiştir. Antibakteriyel etkiye sahip bileşiklerin E. coli bakterisi üzerindeki etkisi de araştırılmış ve DNA mikrodizin analizi sonucunda farklı işleve sahip birçok genin strese cevapta rol oynadığı belirlenmiştir. Bir diğer çalışmada ise, bakteriler için besin azlığı ve diğer streslerde rol alan korunmuş bir sistem olan RpoS regülatörü çalışılmıştır. Çalışmada E. coli (MG1655) suşunun rpoS geni silinmiş ve DNA mikrodizin analizi sonucu ifadesi artan ve azalan genler belirlenmiştir.

Bakteri dünyasında birçok stres ortamında genlerin ifadeleri DNA mikrodizin analiz yöntemi ile belirlenebilmektedir. Ayrıca ökaryotik canlılarda da bu yöntem ile birçok analiz yapılmaktadır. Genel anlamda Mikrodizin analiz yöntemi, farklı zaman, farklı doku ve hastalık durumlarında deęişiklik gösteren genleri belirleme, kompleks genetik hastalıkları araştırmada, ilaç bulma, toksikoloji çalışmaları, polimorfizm belirleme (SNP's) ve patojen analizlerinde kullanım için geliştirilmiş bir teknolojidir.

Anahtar kelimeler: DNA mikrodizin, Escherichia coli, mRNA, Transkriptomik.

Lif üretimi amaçlı yetiştirilen endüstriyel kenevir (*cannabis sativa l.*) ile ilgili bazı agronomik çalışmalar

Mustafa Can
İl Tarım ve Orman Müdürlüğü, Uşak, Türkiye
mustafican@gmail.com

Özet: Kenevir (*Cannabis sativa L.*) cannabaceae familyasından, tek yıllık, lif ve yağlı tohum kaynağı bir bitkidir. Kenevirin ana vatanı Orta Asya olup ılıman iklim kuşağından subtropik iklim kuşağına kadar yayılım gösterir. Kenevir bitkisi insanlık tarihi boyunca kullanılmış en eski lif bitkilerinden birisi olmasına rağmen, esrar eldesinde kullanılabilmesi ve zamanla sentetik liflerin yaygınlaşması ile kenevir üretimi Dünya’da azalmış, Türkiye’de ise bitme noktasına gelmiştir. Kenevir tekstil, ilaç, kâğıt, biyoyakıt, kozmetik ve otomotiv gibi birçok farklı sektörde oldukça geniş bir kullanım alanı bulmuştur. Türkiye’deki iklim şartları kenevir yetiştirmeye elverişlidir. Bu nedenle; Türkiye’de ana lif bitkisi olarak yetiştirilen pamuk bitkisinin yetiştirilme olanağının bulunmadığı alanlarda yetiştirilebilecek en önemli lif bitkilerinden birisi de kenevidir. Diğer taraftan kenevir, dünyanın bir çok ülkesinde, biopolimer, inşaat, kozmetik ve farmasotik gibi alanlarda modern kullanım alanları bulmaya başlamıştır. Gelecekte, kenevirin tarımı ve sanayisinin ekonomide daha fazla pay bulması beklenmektedir. Bu derleme çalışmasında, özellikle lif amaçlı kenevirin agronomisi ve konu ile ilgili güncel çalışmalar araştırılmış, Türkiye kenevir tarımı açısından katkılarından bahsedilmiştir.

Anahtar Kelimeler: Endüstriyel kenevir, *Cannabis sativa L.*, Lif bitkileri, Agronomi, Kenevir yetiştirme.

Mühliye (*Corchorus olitorius*) bitkisinin bileşimi, beslenme ve sağlık açısından önemi

Nezahat OLCAY*, Mustafa Kürşat DEMİR

Necmettin Erbakan Üniversitesi, Mühendislik ve Mimarlık Fakültesi, Gıda Mühendisliği Bölümü,
Demeç Sokak, 42090, Konya/TÜRKİYE

*olcaynezahat@gmail.com

Özet: Tiliaceae familyasına ait olan *Corchorus* (jüt) cinsi, gıda ve lif üretimi amacıyla tropik, subtropik ve ılıman bölgelerde yetiştirilen, Afrika kökenli, 50-60 türden oluşan bir bitki çeşididir. Gıda olarak tüketilen *Corchorus olitorius* türü, mühliye olarak isimlendirilmektedir. Mühliye 1-2 yıllık, odunsu gövde ve oval-mızrak şeklinde tırtıklı yeşil yapraklara sahip bir bitkidir. Afrika, Hindistan, Karayipler, Brezilya, Kıbrıs, Yunanistan, Girit, Bangladeş, Çin, Japonya ve Orta Doğu başta olmak üzere birçok ülke ve bölgede yetiştirilmektedir. Mühliye, iyi bir protein, demir, β -karoten, potasyum kaynağı olup, omega-3 yağ asidi, folik asit ve karotenoidler açısından zengin bir bitkidir. Ayrıca fenolik ve flavonoid bileşik içeriği ile yüksek antioksidan özelliklere sahiptir. Mühliye bitkisinin ekstraktları; *Staphylococcus aureus*, *Micrococcus luteus*, *Bacillus cereus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella enterica*, *Salmonella Typhi*, *Yersinia enterocolitica* ve *Enterobacter* türlerine karşı antibakteriyel etki, *Candida albicans*'a karşı ise güçlü antifungal etki göstermektedir. Yahudi ebegümeçi olarak da bilinen mühliye bitkisinin yaprakları, Afrika ve Orta Doğu ülkelerinde sebze olarak tüketilmektedir. Mühliye halk tıbbında; rahatlatıcı, müshil, idrar söktürücü, laktagog ve tonik olarak, aknelere, ağrıya, dizanteriye, bağırsak iltihabına, ateşe, göğüs ağrısına, tümörlere, basura, mesane iltihabına ve belsoğukluğuna karşı terapötik olarak kullanılmaktadır. Yapılan çalışmalarda diyabet, kardiyovasküler rahatsızlıklar ve obezitenin önlenmesinde de kullanımına dikkat çekilmiştir. Besinsel üstünlüğü, kolay temin edilebilmesi, antioksidan özellikleri ve terapötik etkileri ile mühliye, hem geleneksel kullanımda hem de yeni ürünlerin geliştirilmesinde önem arz eden bir bitki olarak görülmektedir.

Anahtar Kelimeler: Jüt, *Corchorus olitorius*, Mühliye, Antioksidan.

BIOLOGY

Systematic studies on mites of the family Zerconidae (Acari: Mesostigmata) in Coastal Aegean Section (Turkey)

¹Raşit URHAN, ²Mehmet KARACA

¹Pamukkale University, Faculty of Science & Arts, Department of Biology

²Denizli Vocational School of Technical Sciences, Department of Electronic & Automation,
Biomedical Device Technology Program
rurhan@pau.edu.tr

Özet: Systematic studies on zerconid mites continue for many years in Turkey, however, full species list has not been established yet. This study present the new data on species diversity of zerconid mites in Coastal Aegean Section of Turkey. Various materials (especially litter, soil and moss samples) were collected from suitable forestlands in research area between December 2019 and June 2020. Later, these materials were examined, zerconids were sorted and identified. As a result of these studies, 11 Prozercon species (*P. banazensis*, *P. bulgariensis*, *P. erdogani*, *P. miraci*, *P. sellnicki*, *P. tragardhi*, *P. umidicola*, *P. yavuzi*, *P. sp.1*, *P. sp.2* and *P. sp.3*) and 13 Zercon species (*Z. colligans*, *Z. cretensis*, *Z. denizliensis*, *Z. ignobilis*, *Z. kallimcii*, *Z. marinae*, *Z. quadricavum*, *Z. similifoveolatus*, *Z. sp.1*, *Z. sp.3*, *Z. sp.4*, *Z. sp.5* and *Z. sp.6*) were found. Among them, 8 species (*P. banazensis*, *P. bulgariensis*, *P. sp.1*, *P. sp.2*, *P. sp.3*, *Z. ignobilis*, *Z. sp.5* and *Z. sp.6*) were recorded for the first time from research area in this period. Number of recorded zerconid mites rised to 34 species from Coastal Aegean Section. Also, it is thought that 3 Prozercon (*P. sp.1*, *P. sp.2* and *P. sp.3*) and 2 Zercon (*Z. sp.5* and *Z. sp.6*) species may be new for the science. Field and laboratory studies are still continue. It is hoped that new additions to biodiversity of zerconids will soon be recorded from the research area.

Keywords: Zerconid mite, Diversity, Taxonomy, Aegean region, Turkey

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Systematic investigations on zerconid mites (Acari: Zerconidae) in Buharkent, Karacasu and Kuyucak Counties

¹Davut Rıza BULUT, ²Raşit URHAN, ³Mehmet KARACA

¹Pamukkale University, Institute Sciences, Department of Biology

²Pamukkale University, Faculty of Science & Arts, Department of Biology

³Denizli Vocational School of Technical Sciences, Department of Electronic & Automation,
Biomedical Device Technology Program
drizabulut05@gmail.com

Abstract: Systematic of Zerconidae mites are well studied in Turkey. Up to now, 123 species belonging to two genera (Prozercon and Zercon) have been recorded from this country. Members of this family colonise in various substrates, especially in humus, litter and mosses pads, however some occasional records from nests of ants, birds and small terrestrial mammals are available. 407 different materials (litter, soil and moss samples) were collected from 98 localities in 3 counties (Buharkent, Karacasu and Kuyucak) of Aydın province between February 2019 and February 2020 period. After that, these samples were transferred to acarology laboratory for identification of zerconid mites. During examinations of specimens, following terminologies were used: Sellnick (1958), Halašková (1969), Błaszak (1974), Mašan & Fend'a (2004). As a result of field and laboratory studies, 2 Prozercon (*P. demirsoyi* and *P. yavuzi*) and 5 Zercon (*Z. colligans*, *Z. cretensis*, *Z. denizliensis*, *Z. huseyini* and *Z. sp.*) species were identified. Among them, female and male specimens of *Z. sp.* has various morphological characters unlike the remaining Zercon species. Most probably, it will be reported as a new Zercon species in the near future. With the present study, a remarkable contribution has been provided to Zerconidae fauna of Aydın Province.

Keywords: Zerconids, Species list, distribution, Aydın, Turkey

Acknowledgements: This paper is prepared based on first author's M.Sc thesis and related study was financially supported by TÜBİTAK (Scientific and Technological Research Council of Turkey), with 118Z101 project number.

Abanoz Yaylası (Anamur-Mersin, Türkiye)'nin Briyofitleri

¹Ahmet Uygur, ²Tülay Ezer, ¹Seher Karaman Erkul, ³Mevlüt Alataş
¹Aksaray Üniversitesi, Fen Edebiyat Fakültesi, Biyoloji Bölümü, Aksaray/Türkiye
²Niğde Ömer Halisdemir Üniversitesi Mimarlık Fakültesi Peyzaj Mimarlığı Bölümü,
Niğde/Türkiye
³Munzur Üniversitesi, Tunceli Meslek Yüksek Okulu, Bitkisel ve Hayvansal Üretim Bölümü,
Tunceli/Türkiye
*uygur3347@gmail.com

Özet: Bu çalışmada, Abanoz Yaylası (Anamur-Mersin, Türkiye) briyofitleri çalışılmıştır. Çeşitli habitatlardan toplanan 72 briyofit örneğinin teşhis çalışmaları sonucunda 12 familya ve 25 cinse ait toplam 51 takson (1 çiğerothu, 50 karayosunu) tespit edilmiştir. Bunlardan 10'u Henderson'un Türkiye kareleme sistemine göre C12 karesi için yeni kayıttır. Çalışma alanındaki en büyük iki familya Pottiaceae (15 takson) ve Grimmiaceae (11 takson) olurken, en yaygın cinsler *Schistidium* (6 takson) ve *Grimmia* (5 takson)'dır. Ayrıca, tespit edilen taksonların ekolojik karakteristikleri de analiz edilmiştir.

Anahtar Kelimeler: Abanoz Yaylası, Anamur, briyofit, Mersin, Türkiye

Teşekkür: Bu çalışma, Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) (Proje No: 120Z046) tarafından finansal olarak desteklenmiştir. Maddi desteği için teşekkür ederiz.

Karınca Dağı'nın (Pozantı - Adana) endemik bitkileri ve IUCN tehlike kategorileri

¹Ali KESKİN, ²Seher KARAMAN ERKUL, ¹Tülay EZER, ²Mehtap TEKŞEN
¹Niğde Ömer Halisdemir Üniversitesi Fen Edebiyat Fakültesi Biyoloji Bölümü
²Aksaray Üniversitesi Fen Edebiyat Fakültesi Biyoloji Bölümü

*biyologalikeskin@gmail.com

Özet: Bu çalışmada, Karınca Dağı'nın (Pozantı-Adana) endemik bitkileri ve IUCN tehlike kategorileri araştırılmıştır. Akdeniz bölgesi (6) Adana bölümünde (6b) yer alan çalışma alanından 2018-2020 yılları arasında toplanan tohumlu bitki örneklerinin teşhis çalışmaları sonucunda, 13 familya ve 23 cinse ait toplam 26 endemik takson tespit edilmiştir. Bunlardan 11'i İran-Turan elementi, 7'si Akdeniz elementi ve 1'i de Oksin elementidir. Endemik takson sayısı bakımından Brassicaceae (5 takson) ve Lamiaceae (5 takson) en zengin familyalar olurken *Aubrieta* Adans. ve *Salvia* L. ikişer taksonla en zengin cinslerdir. Taksonların IUCN tehlike kategorilerine göre dağılımı; Düşük Riskli (LC) 8 (% 30,7), Duyarlı (VU) 3 (% 11,5), Tehdide Yakın (NT) 2 (%7,6) olarak belirlenmiştir.

Anahtar Kelimeler: Karınca Dağı, Endemik, Adana, 6b bölümü, Türkiye

Studies conducted on Turkey Aphid Fauna and implications for Turkic World Countries

¹Gazi Görür, ²Hayal Akyıldırım Beğen, ¹Özhan Şenol, ¹Gizem Başer
¹Niğde Ömer Halisdemir University
²Artvin Çoruh University

ggorur@ohu.edu.tr

Abstract: Aphids are an important phloem sucking insect, they have higher reproductive capacity, diverse plant preferences, transmitting about 60% of plant viruses, causing tremendous crop loss and benefiting from global warming. About 5100 aphid species determined around the world and Turkey aphid fauna consist of about 573 species. Turkey geographically located at the junction of important continents and passageway of the floristic and faunistic members. Turkey consists of about 12.000 plant species and about 31 % are endemic. Richness of flora, larger agricultural landscape-crop diversity, having a different types of climates even in the same season resulted in Turkey being naturally suitable for aphids. There are still localities to be studied and no sufficient database about amount of agricultural damage. Recent predictions offered by researchers pointed out that listed composition does not show real situation of Turkey aphidofauna. Moreover, recent climatic changes are going to affect composition and agricultural damages of aphid species. Following international literatures reflect similar situations among Turkic World Countries for aphid studies. For example, flora of Kyrgyzstan is various- luxurious, range of altitudes, alternation of mountain ridges-hollows and local isolations, but there is no detailed information about aphid diversity. There should be more research institutions, coordination and collaborations among Turkic Countries to find out present composition and agricultural importance of aphid species in our region. All Turkic countries are most likely to be affected from global warming and therefore more detailed study should be carried out to search current aphid fauna and make predictions for future changes

Keywords: Aphid, Host Plant, Turkey

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Altındere Vadisi'nin (Maçka, Trabzon, Türkiye) Epifitik Briyofit Florası

¹Nevzat BATAN, ²Mevlüt ALATAŞ, ^{3*}Tülay EZER, ⁴Hüseyin ERATA

¹Karadeniz Teknik Üniversitesi, Maçka Meslek Yüksekokulu, Trabzon/Türkiye

²Munzur Üniversitesi, Tunceli Meslek Yüksekokulu, Tunceli/Türkiye

³Niğde Ömer Halisdemir Üniversitesi, Mimarlık Fakültesi, Peyzaj Mimarlığı Bölümü,
Niğde/Türkiye

⁴Çanakkale Onsekiz Mart Üniversitesi, Bayramiç Meslek Yüksekokulu, Çanakkale/ Türkiye

*tuezer@gmail.com; tezer@ohu.edu.tr

Özet:Bu çalışmada, Altındere Vadisi'nin (Maçka-Trabzon) epifitik briyofit florası araştırılmıştır. 2018-2020 yıllarının farklı vejetasyon dönemlerinde, alanın farklı lokalite ve habitatlarındaki (14 istasyon) çeşitli ağaçlar üzerinden toplanan 466 epifitik briyofit örneğinin teşhis çalışmaları sonucunda 27 familya ve 37 cinse ait toplam 55 takson (13 ciğerotu, 42 karayosunu) tespit edilmiştir. Epifitik taksonlar tarafından en çok tercih edilen ağaç *Alnus glutinosa* olurken en az tercih edilen ağaç *Castanea sativa* olmuştur. Ayrıca, ekolojik ve floristik yönden incelenen taksonların çoğunun mezofitik, sciofit ve subnötrotrotit karakterde olduğu belirlenmiştir.

Anahtar Kelimeler: Briyofit, Epifitik, Flora, Altındere Vadisi, Türkiye

Teşekkür: Bu çalışma, Türkiye Bilimsel ve Teknolojik Araştırma Kurumu (TÜBİTAK) (Proje No: 119Z711) tarafından finansal olarak desteklenmiştir. Maddi desteği için teşekkür ederiz.

***Micaria* ve *Nomisia* (Araneae: Gnaphosidae) Cinsi Yer Örümceklerinin Seta Morfolojilerinin Karşılaştırılması**

Durmuş OK^{1,2}, Osman SEYYAR¹, Hakan DEMİR¹

¹Niğde Ömer Halisdemir Üniversitesi, Fen-Edebiyat Fakültesi, Biyoloji Bölümü

^{1,2}Nevşehir Hacı Bektaş Veli Üniversitesi, Avanos MYO, Bitkisel ve Hayvansal Üretim Bölümü
oseyyar@ohu.edu.tr

Özet: Örümceklerin vücutlarının dış kısmı seta adını verdiğimiz kıl benzeri yapılarla kaplıdır. Yer örümceklerinde bu yapıların cins düzeyinde farklılıklar gösterdiği bilinmektedir. Bu çalışmada, Erciyes Dağından toplanmış olan 2 cinse ait 4 türün seta morfolojileri çalışılmıştır. *Micaria rossica* Thorell, 1875, *Micaria coarctata* (Lucas, 1846), *Nomisia exornata* (C.L. Koch, 1839) ve *Nomisia aussereri* (L. Koch, 1872) türlerinin genellikle abdomen ve sefalotoraks gibi vücut kısımları üzerinde yer alan setaların morfolojileri Scanning Electron Microscopy (SEM) kullanılarak belirlenmeye çalışılmıştır.,

Anahtar Kelimeler: Gnaphosidae, Seta, Erciyes Dağı, Örümcek, Araneae

Fenolik bileşiklerden benzoik asit, ferulik asit ve kuersetinin canlı organizmalar üzerindeki biyolojik aktiviteleri

Hatice Öztürkel, Merve Sezer Kürçü, Bekir Çöl
Muğla Sıtkı Koçman Üniversitesi
haticeozturkel@posta.mu.edu.tr

Özet: Fenolik bileşikler bitkilerin biyotik ve abiyotik ortamlara uyum sağlamasında, bitkisel kaynaklı ürünlerin renk, tat ve kokusunun oluşmasında rol oynayan fitokimyasallardır. Fenolik bileşiklerin, bitkilerde yaygın olarak bulunması farmasötik ve tıbbi uygulamalar için önemli bir kaynak oluşturmaktadır. Bitkilerde ve propolisde yaygın olarak görülen Benzoik asit, Ferulik asit ve Kuersetin eldesi kolay ve yararlanımı yüksek fenolik bileşiklerdir. Sentetik veya yarı-sentetik ilaçların yaygınlaşması ve yan etkilerinin görülmesi doğal hammaddelerin kullanılması gerektiği bilincini oluşturmuştur. Mikroorganizmaların antibakteriyel ajanlara karşı direnç geliştirmesi, oksidatif stresden kaynaklanan hücre ölümü, yaşlanma, kanser, gıda bozulmalarının neden olduğu zehirlenmeler, medikal ürünlerin mikroorganizmalar tarafından kontaminasyonu, sentetik kimyasalların organizmada neden olduğu toksisite gibi sebepler bu kimyasalların etkilerinin geniş çaplı araştırılmasını teşvik etmektedir. Fenolik bileşiklerin en iyi bilinen etkisi antioksidan aktivitedir. Bitki kökenli antioksidanlar olan fenolik bileşikler organizmayı Reaktif Oksijen türlerinin neden olduğu hasara karşı korumaktadır. Günümüzde diyet ürünlerinden, kozmetik ürünlerine kadar pek çok alanda doğal ve antioksidan aktivitesi güçlü bileşikler tercih edilmektedir. Bu durum doğada yaygın olarak bulunan fenolik bileşiklerin etkilerinin araştırılmasını ve kullanımını gerektirmektedir.

Anahtar Kelimeler: Fenolik bileşik, Biyolojik aktivite, Ferulik asit, Kuersetin, Benzoik asit.

The evolution of the horses of Eurasia: from Botai to the present day

^{1,2}Murat Nurushev, ²Laura Adelbaeva, ²Turar Zhumabaev

¹Russian Academy of Natural Sciences

²L.N. Gumilyov Eurasian National University

nuryshev@mail.ru, lauraaddel.0@gmail.com, zhumbai175@mail.ru

Abstract: In the Botai culture we are most interested in the horse, and therefore, it is clear that we want to solve all the problems associated with the Botai horse as soon as possible. As it is known, horse bones in the settlement of Botai make up 99.9% of all animal remains. Many horse bones were also found in other settlements of the Botaysky economic-cultural type (Sergeevka, Roshinskoe, Krasny Yar, Kenetkul, Salt Lake I). However, the absence of morphological and biometric data of the Neolithic-Eneolithic horses in other regions does not allow making a comparison of the bones of the Botai horse with the few known findings of this era. The obtained measurements, their comparison with the data of the Pleistocene horses, horses of the Bronze Age, Tarpan and the Przewalski's horse, along with some similarities of individual signs, show some originality in the structure of the Botai horse.

Keywords: Botai horse, Neolithic-Eneolithic, Tarpan, Przewalski's horse, Domestication of the horse

ECOLOGY

A Study on Water Absorption in Geopolymer Composites

Beata Figiela, Barbara Kozub, Kinga Korniejenko
Institute of Material Engineering, Faculty of Material Engineering and
Physics, Cracow University of Technology

beata.figiela@pk.edu.pl

Abstract: The main motivation of this study is to develop the advanced composites for civil engineering applications as material for the building industry, especially for application in water environment. The new materials for marine as well as inland water applications are specific challenges in the world market. The basic problems include the corrosion and the deterioration of materials. Despite of their resistance against the corrosion, the materials, can be damaged because of the affection of the environmental stressors, such as soluble salts from the greenhouse acid gases, sulphur oxide, nitric oxide and carbon oxide can accelerate the corrosion. Geopolymers are environmentally friendly, sustainable, and resource efficient class of materials. The main objective of the article is to analyze effect of water absorption on the mechanical properties of geopolymer composites. The research includes four types of samples reinforced by flax fibers: two foamed and two solid one. As raw material fly ash class F from the coal power plant 'Skawina' (located in: Skawina, Lesser Poland, Poland) and metakaolin were used. As a foamed agent H₂O₂ was applied. The research includes mechanical properties and water absorption in salt and fresh water. The results showed that the environmental conditions as well as materials' structure had a significant influence on mechanical properties of geopolymer composites. The policy of sustainable development and the circular economy is a major factor in the development of sustainable building materials and the reduction of their environmental impact. It is a current and interesting issue in many aspects, which is important for the subject of the conference.

Keywords: Water Absorption, Geopolymer Composites, Foamed Geopolymer, Flax Fibres

Influence of fibers addition on the mechanical properties of geopolymer composites

¹Celina Ziejewska, ²Michał Łach, ³Kinga Korniejenko, ⁴Marek Hebda (Arial 10)
Institute of Materials Engineering, Faculty of Materials Science and Physics, Cracow University
of Technology, Kraków, Poland

mhebda@pk.edu.pl

Abstract: The development of a 3D printing technology for the production of a universal residential building, with a construction that is easy to transport and fast to assemble, as well as with the possibility of simple and quick expansion depending on the needs of users requires the use new materials. One of such modern materials is geopolymers or cement-geopolymer hybrids, which can be additionally reinforced with fibers. In the present study, fly ashes were used as aluminosilicate raw materials to prepare geopolymers. In order to improve the strength properties of the samples, reinforcement in the form of fibers was used. Geopolymers samples with different contents of carbon, aramid, and glass fibers reinforcement in the form of a roving (from 0.5 to 5.0 wt.%) were produced. Samples without fibers were used as reference material. The process of alkaline activation was carried out using 10 M sodium hydroxide solution with an addition of an aqueous sodium silicate solution. The results indicated that the proper amount and type of reinforcement introduced into the geopolymer may significantly change the final mechanical properties of samples.

Acknowledgements: The authors are grateful to the National Centre for Research and Development, Poland for support from the projects: "Development of 3D printing technology for construction and facade prefabricated elements made of concrete composites and geopolymers" project no. POIR.04.01.04-00-0096/18.

Keywords Geopolymers, Composites, Mechanical properties, Fiber reinforce

Development of innovative 3D printing technologies for concrete and geopolymer composites

¹Joanna Marczyk, ²Kinga Korniejenko, ³Michał Łach, ⁴Marek Hebda
Institute of Materials Science, Faculty of Materials Science and Physics, Cracow University of
Technology, Kraków, Poland.

mhebda@pk.edu.pl

Abstract: Nowadays, creating unconventional concepts and original solutions leads to the creation of modern technologies, which is an integral part of development. Moreover, cooperation between different research and industrial centers during the creation of new implementations is not only an excellent example of the possibility of correlating various ideas, but also faster and effective accomplishment of the objectives. An example of such cooperation is a research project implemented between two partners - Cracow University of Technology and a construction company: Centrum Ekologicznego Budownictwa Mieszkaniowego Sp. z o.o. The Cracow University of Technology submitted and obtained a project entitled: "Development of 3D printing technology for construction and facade prefabricated elements made of concrete composites and geopolymers" project no. POIR.04.01.04-00-0096/18, financed by the National Center for Research and Development, whose implementation began in January 2019. The aim of the project is to develop a special printer using fiber-reinforced materials: geopolymer or concrete geopolymer hybrids, for printing residential buildings in 3D technology. The proposed solution is based on the idea of creating a universal building with an easy to transport and assemble structure. An innovative aspect is the use of modern filaments in the form of geopolymer, i.e. an aluminosilicate material, which is characterized by both high strength as well as high fire resistance, heat resistance and frost resistance.

The authors are grateful to the National Center for Research and Development, Poland for support from the project no. POIR.04.01.04-00-0096/18.

Keywords: 3D printing, Geopolymer, Concrete, Composite, Construction

Investigation of the impact of mercury pollution on the soil cover of the city of Pavlodar

¹Aizhan Zhumali

¹L.N. Gumilyov Eurasian National University

aizhanzhumali@mail.ru

Abstract: Soil is one of the most important components of the ecosystem. It is an almost irreplaceable life support resource on the planet and performs a protective role in relation to natural waters, the atmosphere and vegetation. But at the same time, being the main accumulator of man-made chemicals and a factor in the transmission of infectious and parasitic diseases, the soil can have an adverse impact on the environment and human health [1]. Within urban areas, soils are subject to chemical, biological and radioactive contamination. Special attention is paid to the assessment of chemical contamination of soils by heavy metals and organic toxicants. Heavy metals are priority pollutants that must be monitored in all environments. Accumulation of polluting chemical elements in urban soils is largely associated with industrial enterprises and their waste, emissions and discharges [2]. The most important criteria that determine the priority of pollutants are such properties as the scale of their entry into the environment (power of sources), biochemical activity, toxicity, the ability to accumulate in trophic units, mobility in natural environments, and resistance to natural factors. From this point of view, many heavy metals (mercury, lead, cadmium, arsenic, etc.) are priority pollutants of the environment. It is necessary to conduct research to assess the degree of pollution of natural environments and environmental damage caused by these substances [3]. Mercury is one of the most toxic environmental pollutants. And although it was known to ancient civilizations, the mercury pollution of the environment has become a particularly acute problem only in recent decades. The negative impact of mercury on living organisms is associated with its ability to block protein molecules, disrupt their biosynthesis, cause mutagenic changes in DNA, and inhibit the growth and development of living organisms. [4]. Therefore, the study of mercury contamination of soil cover is relevant.

Keywords: Soil cover, mercury, laboratory methods, heavy metals, atomic absorption method, soil, industrial zones

Use of algae for water purification

¹Tuganay Bekkozha

¹L. N. Gumilyov Eurasian National University

tia_9393@mail.ru

Abstract: With the widespread use of modern industrial methods in practice, reliable and cheap methods of wastewater treatment in open reservoirs are becoming more widespread. In terms of water treatment quality, biological ponds give better results when compared with other biological systems, such as biofilters.

Keywords: algae. water. purification

Yenilikçi bir gıda: su mercimeği (Lemnaceae)

Nezahat OLCAY, Mustafa Kürşat DEMİR
Necmettin Erbakan Üniversitesi, Mühendislik ve Mimarlık Fakültesi, Gıda Mühendisliği Bölümü,
Demeç Sokak, 42090, Konya/TÜRKİYE
olcaynezahat@gmail.com

Özet: Su mercimeği, Lemnaceae familyasında sınıflandırılan, doğal su kütlelerinin üzerinde büyüyen, küçük, yüzen sucul bitkilerdir. En basit çiçekli bitkiler grubunu oluşturan su mercimeklerinin yapısı, yaprak işlevindeki "frond"lar ve bu frondlara bağlı basit köklerden meydana gelmektedir. Lemnaceae familyasında 5 cins (Landoltia, Lemna, Spirodela, Wolffia ve Wolffia) ve 37 tür tanımlanmıştır. Genellikle tropik ve ılıman iklimlerde yetişmekte ve vejetatif olarak çoğalmaktadır. Su mercimeği Tayland, Kamboçya ve Laos gibi Asya ülkelerinde geleneksel bir gıda olarak tüketilmektedir. Su mercimeği, kuru maddede yaklaşık % 30 protein içeriği ile lüpen, kolza ve bezelye ile rekabet edebilecek bir konumda görülmektedir. Amino asit içeriklerinin metiyonin hariç FAO tarafından önerilen seviyelerden yüksek olduğu ve kritik amino asit içeriklerinin ise WHO tarafından önerilenlerden daha yüksek olduğu bildirilmiştir. Su mercimeği pigmentlerce, özellikle de karoten ve ksantofilce zengin bir bitkidir. Su mercimeğinde toplam yağ asidi içeriğinin yaklaşık % 80'ini oluşturan baskın yağ asitleri palmitik asit, linoleik asit ve linolenik asittir. Su mercimeği ekstraktları önemli hidrojen peroksit yakalama aktivitesi ile antibakteriyel ve antikandidal etkiye sahiptir. Lemnaceae ailesindeki bitki türleri, Rusya, Çin ve bazı Avrupa ülkelerinde halk tıbbında; ateş düşürücü, idrar söktürücü, analjezik, nemlendirici, kanamayı durdurucu, tonik, serinletici, kloretik (safra artırıcı), antiskorbüt, antelmintik (bağırsak solucanlarını düşürücü), iltihap önleyici ve antimikrobiyal olarak yaygın şekilde kullanılmaktadır. Atık su arıtımı, biyoyakıt hammaddesi, hayvan yemi gibi diğer birçok kullanım olanaklarına karşın, yüksek besin değeri ve zengin protein içeriği nedeniyle insan beslenmesinde takviye edici bir besin maddesi olarak kullanım potansiyeline sahip olan su mercimeği gelecek vaat eden önemli bir yenilikçi gıda olarak görülmektedir.

Anahtar Kelimeler: Su mercimeği, Lemnaceae, Protein ikamesi, Antioksidan, Yenilikçi gıda.

Diagnosis and forecast of air pollution in the city of NUR-SULTAN

Inabat Imanbayeva, Bauyrzhan Kapsalyamov
L.N. Gumilyov Eurasian National University
inabat_22_97@mail.ru

Abstract: the study describes the quality of atmospheric air in the city of Nur-Sultan. The study examined the average annual emissions of hazardous waste to the atmosphere, vehicle statistics, air pollution index, distribution of air emissions and their impact in the period 2004-2018.

Research methods: geographical-comparative, statistical and other research methods.

Keywords: Atmospheric pollution index, Maximum permissible concentration, Carbon monoxide, Nitrogen dioxide, Dust, Hydrogen fluoride.

Technologies and methods of wastewater reuse

Nurbayev Yerkebulan Askaruly
L. N. Gumilyov Eurasian National University
Ero_kz@mail.ru

Abstract: This article provides technologies and methods for water recycling. Currently, there is a shortage of water and problems with its pollution. To solve such problems, new technologies are needed for water treatment or reuse of wastewater and rainwater.

The term " water recycling" is usually used as a synonym for water recycling and water reuse. This article contains information about the reuse or treatment of waste water . Technology of rational use of rainwater, methods of bringing wastewater to the quality of drinking water and its use in other industries.

Keywords: Water, reuse, recycling, water recycling, pollution, drinking water, purification, rain water, efficient use.

Biological wastewater treatment for environmental use

Temirkhan Laura Pakhirdinkyzy

L. N. Gumilyov Eurasian National University. Master's degree in natural science

Scientific supervisor - Meiramkulova K.S. Professor, D.B.SC.

Temirkhanl2020@mail.ru

Abstract: The problem of wastewater treatment in combination with the possibility of their reuse is investigated. The article mentions the practice of extracting a useful component from wastewater and further applying it in agriculture or depositing it. The method of biological wastewater treatment, as well as methods of processing the resulting precipitation, is considered. A description of a promising technology that allows cleaning of concentrated precipitation is given.

Keywords: Water, reuse, recycling, water recycling, pollution, drinking water, purification, rain water, efficient use.

Территориальное перераспределение водных ресурсов реки Иртыш как метод повышения водообеспечения центральных и северных регионов Казахстана

Г.Е. Саспугаева PhD, доцент
Ә. М. Жакен, магистрант 2 курса
Евразийский национальный университет имени Л.Н. Гумилева,
Нур-Султан, Казахстан
gulnur_erzhanovna@mail.ru, zhaken.asel@gmail.com)

Аннотация В статье приведен обзор мирового опыта территориального распределения поверхностных водных ресурсов, в частности опыт Китайской Народной Республики, Североамериканского континента, проекты Советского Союза. Исходя из мирового опыта, можно отметить, что наиболее крупномасштабные проекты прероброски стока не оправдываются по ряду причин – значительное воздействие на окружающую среду, возникновение сложностей в регулировании геополитики, высокая стоимость реализации проектов. Однако множество небольших внутри- и межбассейновых перебросок показали положительные результаты. Такие переброски позволяют решить несколько задач, таких как социально-экономическое развитие региона, сохранение устойчивости среды экосистемы, что достигается за счет неистощения местных региональных водных ресурсов. Принимая во внимание опыт других стран, для решения насущных водохозяйственных задач и сохранения экологической устойчивости региона предложено проектирование канала для обеспечения центральных и северных регионов Казахстана.

Ключевые слова: водные ресурсы, регулирование стока, территориальное перераспределение водных ресурсов, перераспределение речного стока

Determination of ash content of spruce needles as an indication of air pollution environment (for example, Zheruiyk Park)

Karabayeva Aisana Muslimatov¹, Adilbektegi Gulmira¹

¹L. N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan
gabdullina.a@list.ru

Abstract: Like a filter, plants purify the air from dust, soot and toxic gases. Some of the absorbed substances are detoxified in plant organisms. The resulting non-toxic products may be partially released into the environment. In this process, plants play a primary role, and nothing can replace their activity. At the same time, plants are significantly affected by environmental pollution.

In large cities, forest stands play a very important role in cleaning the atmosphere. Recently, we have strengthened environmental safety in the capital of Kazakhstan, increasing the number of green spaces and creating a green belt in Nur-Sultan.

This article aims to analyze the results of laboratory studies on the content of the three main pollutants (iron, copper and nickel) in needles. Samples were taken in the Zheruiyk park at 5 sites at a distance of 50 m, 100 m, 150 m, 250 m, 350 m from the road. As a result, heavy metals, silicas, and sand were discovered. Research is carried out in the chemical-analytical laboratory of Azimut Geology LLP.

The difficult environmental situation that has developed in the city of Nur-Sultan in recent years, associated with increasing air pollution, undoubtedly affects the state of forest plantations, which makes the relevance of laboratory research.

Laboratory studies using the methods of ashing on the example of common spruce showed that in comparison with the control, all 4 sites surveyed had an excessive content of heavy metals (iron, copper and Nickel) in the ash, which once again confirms the presence of atmospheric air pollution.

Keywords: Heavy Metals, Norway Spruce, Park, Pollutants, Plants, Technogenic Processes.

Assessment and Forecasting of waste volumes generated by mining, metallurgical and energy industries and the possibility of its processing

¹Eldos Abakanov, ¹Baurzhan Kapsalyamov, ¹Marat Nurushev
¹L.N. Gumileva, Nur-Sultan
eldos_abakanov@mail.ru

Abstract: One of the most important areas of environmental protection is the rational organization of the process of managing production and consumption waste. An important role in this process is played by economic incentives for the implementation of low-waste and non-waste technologies, waste processing in order to neutralize and utilize them. The bulk of the hazardous waste generated is in mining and quarrying. Historically, Kazakhstan is a region with a leading mining industry over other industries. According to proven reserves, the country ranks first - chrome, lead, zinc; second place is uranium; fourth place - copper. Total coal reserves are estimated at 150 billion tons; 10% of the world's iron ore reserves are concentrated in Kazakhstan, as well as 30% of chromium ore and 25% of manganese ores.

This in turn puts Kazakhstan in a leading position among the world's hazardous waste producers. As a result of the combination of a large and growing industrial complex and the lack of incentives, most of the hazardous waste remains untreated and is usually stored at the factories. Such storage facilities pose significant risks to public health and the environment.

At the same time, weak stimulation of waste processing, including industrial, led to their significant accumulation. And the scatter of waste storage facilities over a vast territory of the country adds to the complexity of logistics and their processing.

Keywords: Green economy, industrial waste, waste management

Advantages of wastewater treatment

Saspugayeva G.Y.
L.N. Gumilyov Eurasian National University
gulnur_erzhanovna@mail.ru

Abstract: When it comes to innovation in the water industry, a number of cutting-edge advancements are taking place in the area of wastewater. From harvesting energy from biosolids to using recently discovered bacteria in order to more efficiently remove nitrogen from waste, the latest generation of wastewater innovations has the potential to change the way we manage, pay for and profit from wastewater treatment.

Several of alternative technologies have become price competitive with conventional technologies, offer good investment opportunities and should be taken into consideration by policymakers aiming to diversify their national energy matrixes, reduce fuel supply vulnerabilities and cut greenhouse gas emissions.

One outstanding source of green energy is the biogas potential found in the regions highly diverse food, beverage and agribusiness industries, which produce biologically rich wastewater streams. Instead of being an environmental problem, these wastewater streams can be treated anaerobically to simultaneously clean the water to high discharge standards while producing biogas (methane) to generate green electricity or to fuel boilers and other factory plant fuel consumers.

Keywords: Wastewater treatment; biogas; anaerobic technology plants; green energy.

Tekstil endüstrisi pamuk atıklarının komposta dönüştürülerek mantar üretiminde değerlendirilmesi

Neslihan Doğan-Sağlamtimur¹, Gülden Sandal Erzurumlu², Osman Mücevher³, Sinan Alkan⁴,
Mustafa Kaan Doğan⁵, Cemalettin Ünal⁵, Gamze Yıldırım⁶

¹Niğde Ömer Halisdemir Üniversitesi, Mühendislik Fakültesi, Çevre Müh. Bölümü, Niğde,
Türkiye

²Niğde Ömer Halisdemir Üniversitesi, Mimarlık Fakültesi, Peyzaj Mimarlığı Bölümü, Niğde,
Türkiye

³Konya Toprak Su ve Çölleşme ile Mücadele Araştırma Enstitüsü Müdürlüğü, Konya, Türkiye

⁴Selçuk Üniversitesi, Çumra Uygulamalı Bilimler Yüksekokulu, Organik Tarım İşletmeciliği
Bölümü, Konya, Türkiye

⁵Niğde Ömer Halisdemir Üniversitesi, Mühendislik Fakültesi, Çevre Müh. Bölümü, Niğde,
Türkiye

⁶ BİRKO A.Ş. Yönetim Kurulu Üyesi
neslihandogansaglamtimur@gmail.com, nds@ohu.edu.tr

Abstract: Dünyada tekstil atıklarının çok az bir kısmından yararlanılması -hem çevre sorunları hem de ekonomik kayıp olması açısından- sorunun çözümüne yönelik çalışmalar yapılmasını zorunlu kılmaktadır. Bu çalışmada, %100 pamuk kullanan tekstil fabrikalarındaki fan ve/veya klimaların çektiği tekstil endüstrisi pamuk atığı (TEPA), hammadde olarak kullanılmıştır. Çalışmada kompostlaştırmada ve mantar üretiminde en verimli yeniden kullanım formunu belirlemek için, deneme saksılarında TEPA ve yanmış çiftlik gübresi (YÇG) ayrı ayrı (%100 TEPA ve %100 YÇG) veya biraraya getirilip (%50+%50 TEPA+YÇG) karışımlar hazırlanmıştır. Bu deneme setlerinde günlük olarak gerekli ısı, uygun nem, ışık, havalandırma ve pH koşulları sağlanarak TEPA komposta ve mantara dönüştürülmüştür. Mantar tüm evreler boyunca %70-90 arasında neme ihtiyaç duymuş ve bu nem günlük olarak sağlanmıştır. Çalışmanın bütün aşamalarında rutin takip, ölçüm ve gözlemler yapılmış, TEPA ve YÇG kullanılarak oluşturulan setlerin hepsinde kompostlaşma gerçekleşmiş ve mantar üretilenmiştir. Bu multidisipliner yeşil mühendislik çalışması, literatürde ilktir, TEPA'nın hammadde olarak yeniden kullanılmasıyla çevresel problemlerin azaltılması, sıfır atık, endüstriyel simbiyoz ve ülke ekonomisine katkı sağlanması, iki ürünlü bir atık değerlendirmesi yapılması yönleriyle özgündür.

Keywords: Atık, mantar, kompost, pamuk, tekstil

Waste management suggestions for covid-19 pandemic conditions

Fehiman Çiner, Neslihan Doğan-Sağlamtimur
Nigde Omer Halisdemir University, Engineering Faculty, Department of Environmental
Engineering, 51240, Nigde, Turkey
neslihandogansaglamtimur@gmail.com, nds@ohu.edu.tr

Abstract: In 2020, coronavirus disease 2019 (COVID-19) spread around the world. Hundreds of cities were locked down and millions of people were infected under unprecedented pandemic conditions, having enormous impacts on the waste sector. The global pandemic has led to an unusual amount of reported medical waste. In these conditions, COVID-19 restrictions (lockdowns) were applied, and then municipalities, public authorities and waste operators had to rapidly adapt their waste management systems and procedures. In this study, it is pointed out the COVID-19, waste management and pandemic conditions, and waste management suggestions for COVID-19.

Keywords: COVID-19, Environment, Health, Pandemic.

CHEMISTRY

Alev geciktirici özellikli selülozik materyaller

¹Cumali Çelik

¹Yalova Üniversitesi, Yalova Meslek Yüksekokulu, Yalova, Türkiye
cumali.celik@yalova.edu.tr

Özet: Yangınları önlemek veya sonucunda yaşanabilecek can ve mal kaybını en aza indirebilmek amacıyla yanmayan veya yanmayı geciktirici malzemelerin kullanımı önemli bir konu haline gelmiştir. Alev geciktirici malzemeler, yanma olayı esnasında gerçekleşen ısınma, bozunma, tutuşma ve alevin büyümesi adımlarından birinde etki göstermektedirler. Yanma için gerekli olan ısı, oksijen ve yakıt faktörlerinden birini veya birkaçını sınırlayarak yanmayı durdurur veya yavaşlatırlar. Selüloz, doğada bulunan birçok polimerden biri olup mükemmel bir lifdir. Ahşap, kâğıt ve pamuğun tümü selüloz içerir, kâğıt ise neredeyse saf selülozdur. Çevremizde büyük miktarlarda kâğıt ve kâğıt benzeri ürünler, genellikle yangın güvenliği hususlarının önemli olduğu durumlarda, günlük olarak tüketilmektedir. Bu nedenle, selülozun alev almasını önleyen, yanıcılık ve alev direnci açısından performans gereksinimine yani alev geciktirici bileşiklere ihtiyaç duyulur. Ülkemizde bolca rezervi bulunan borik asit, son yıllarda yaygın olarak kullanılan ve zehirli olmayan alev geciktiricilerdendir. Borik asit ve boratlar selülozik maddelere, ateşe karşı dayanıklılık sağlarlar. Tutuşma sıcaklığına gelmeden selülozdaki su moleküllerini uzaklaştırırlar ve oluşan kömürün yüzeyini kaplayarak daha ileri bir yanmayı engellerler.

Bu çalışmada, borik asit ile kendisi de alev geciktirici özelliğe sahip olan melaminden elde edilen melamin fosfat borat supramolekülü sentezlenmiştir. Sentezlenen bu melamin tuzunun alev geciktirici karakteristiğini belirlemek amacıyla dikey yanma testi kraft kâğıt parçaları kullanılarak gerçekleştirilmiştir. Elde edilen sonuçlar, belirli oranlarda melamin fosfat boratın eklenmesiyle kraft kağıtın yanma özelliklerinde önemli değişimler olduğunu göstermiştir.

Anahtar Kelimeler: Alev geciktirici, Melamin tuzu, Kâğıt

Effect of Portland cement addition on the setting time of geopolymer concrete

¹Izabela Kurek, ²Michał Łach, ³Dariusz Mierzwiński, ⁴Marek Hebda
Institute of Materials Engineering, Faculty of Material Engineering and Physics, Cracow
University of Technology, Poland

izabelakurek16@gmail.com

Abstract: New composite materials combining concrete and geopolymers could contribute to the development of large-format 3D printer technology used in the construction of residential houses. In this work, geopolymer-cement hybrids based on fly ash with low calcium content and CEM 42.5 Portland cement were tested. Samples containing 0, 5, 10, 15, 20, 25, and 30% by weight of cement were produced. No other additives were used. Sodium hydroxide of various molarities (6 M, 8 M, 10 M) and sodium water glass was used as an alkaline solution. A significant influence of the amount of cement in the geopolymer mass on the setting time of hybrids was found. The Vicat test carried out at ambient temperature showed that the setting time of the produced hybrids decreased with increasing cement content. Moreover, it was observed that the setting time was also influenced by the molarity of the sodium hydroxide solution and the method of its addition to the geopolymeric mass, together or separately with the water glass. The density, compressive strength, and flexural strength of the produced hybrids were also tested.

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Keywords: Geopolymer concrete, Portland cement, Setting time, Compressive strength, Flexural strength

Sulu ortamdaki cd^{2+} ve co^{2+} ağır metal iyonlarının *castanea sativa* (kestane) kabuğu ile önderiştirilmesi ve tayini

Yavuz Sürme*¹, Eda Varol¹

¹ Niğde Ömer Halisdemir Üniversitesi Fen Edebiyat Fakültesi Kimya Bölümü
ysurme@ohu.edu.tr

Özet: Bu çalışmada, sulu ortamda bulunan kadmiyum ve kobalt iyonlarının, buldukları ortamdan kestane bitkisinin "*Castanae sativa*" kabukları adsorban olarak kullanılarak katı faz ekstraksiyonu yöntemiyle önderiştirilmesi ve tayini için optimum şartlar belirlenmiştir. *Castanae sativa* kabukları, bitkinin çiğ meyvelerinden kabukların ayrılması ve öğütülmesi ile elde edilmiştir. Katı faz ekstraksiyonunun optimizasyon basamakları, örnek çözeltiler üzerinde gerçekleştirilmiştir. Optimizasyon basamakları, pH, örnek ve eluent akış hızları, örnek hacimleri ve eluent türleri gibi parametreler bakımından incelenmiş ve önderiştirme işlemi için en uygun koşullar belirlenmiştir. Metal iyonlarının derişimleri alevli atomik absorpsiyon spektrometresi ile belirlenmiştir.

Anahtar Kelimeler: Katı faz ekstraksiyonu, Önderiştirme, *Castanae sativa*, Atomik absorpsiyon spektroskopisi, Ağır metal.

A study of new eco-friendly corrosion inhibitor for mild steel

Demet ÖZKIR^a

^aNiğde Ömer Halisdemir University, Faculty of Arts & Sciences, Department of Chemistry,
51240, Niğde / TURKEY

*dozkir@ohu.edu.tr

Abstract: In this study, the inhibitory effect of *Kitaibelia balansae* Boiss. extract, which is called green inhibitor, on the corrosion of soft steel in 1.0 M HCl solution was investigated by electrochemical impedance spectroscopy (EIS) technique. Mild steel electrodes were immersed in acidic solutions containing different concentrations of plant extract at 1 and 96 h of waiting periods and Nyquist diagrams were formed. From these diagrams, it was concluded that *Kitaibelia balansae* extract showed a high adsorption effect even after 96 h immersion on mild steel surface. As the concentration of the inhibitor extract increased, the polarization resistance values increased accordingly. In addition, the surface images of mild steels immersed in 1.0 M HCl solutions without and with inhibitor at optimum concentration in 96 h waiting period were examined by field emission scanning electron microscopy (FESEM) and it was revealed that the electrode surface in the solution containing the extract had a smoother structure compared to the uninhibited surface.

Keywords: Green inhibitor, EIS, FESEM, *Kitaibelia balansae*, Acidic corrosion.

**PHYSICAL AND TECHNICAL SCIENCES:
Nano Technology&Applications,
Physics&Nuclear Technology**

NANO TECHNOLOGY&APPLICATIONS

Magnetostriction in $\text{Fe}_{1-x}\text{Ga}_x\text{M}$ (M=Ni,Pr)

¹Talgat M. Inerbaev

¹L.N. Gumilyov Eurasian National University

inerbaev_tm@enu.kz

Abstract: The electronic structure of the FeGa alloy is investigated theoretically using methods of the density functional theory. The work aims to explain the difference in changes in the magnetostrictive properties of the material when using various types of doping elements. The effect of interest is explained by the dopant-caused variation of chemical bond character between the iron atoms of the first and second coordination spheres around the impurity atom. Strengthening the bonding nature electronic orbitals between these atoms leads to a decrease in the magnetostrictive effect, while its weakening leads to the opposite effect. In present work we performed computer simulations using the density functional theory of magnetostrictive properties of Ni and Pr of a modified FeGa alloy. It has been shown that the experimentally observed decrease (increase) in the λ_{001} coefficient upon the addition of Ni (Pr) dopants is due to an increase (decrease) in the anti-bonding nature of the chemical bond between the iron atoms in the first and second coordination spheres of the doping atom compared to the situation if, to enhance the magnetostrictive effect gallium was used. The hybridization makes the main contribution of the d-states of iron atoms. In the case of doping with Pr atoms, the effect of *f-d* hybridization is negligible due to the low density of states of the *f*-electrons below the Fermi level.

Keywords: magnetostriction, FeGa alloy, doping, computer modeling Special

Synthssis of thermoluminescent dosimetry materials

¹Bagila Yussupbekova, ²Keleshek Zhanylysov, ³Temirulan Alibay
^{1,2,3}L.N. Gumilyov Eurasian National University

temirulanalibay@gmail.com

Abstract: Alkali metal sulfates are widely used in thermoluminescent dosimetry, radiation diagnostics. These applications require the introduction of additives in measured quantities into the composition of TLD crystals. In crystals, dosimetric information is formed in the form of thermocoupled peaks. The method of preparation of dosimetric materials is lighter than the technological method of processing, and the extracted crystals should differ in high sensitivity properties. Activated powder KNaSO₄-Cu was created by the " wet " method. Then the powder was pressed under pressure. Pills to equimolecular the same mass K₂SO₄, Na₂SO₄ and mixtures of CuSO₄- 5H₂O received. The concentration of the mixture Cu⁺ was 0,04 m.%. Spectrometric and composition analysis was performed for the resulting powders.

Keywords: alkali metal sulfates, thermoluminescent dosimetry, impurity, copper

Hysteretic properties of magnetization and quadrupolar moment in the blume-emery-griffiths model under the pair approximation

¹Songül Özüm, ²Ömer Görgülür, ³Rıza Erdem, ²Orhan Yalçın
¹Hitit University, Alaca Avni Çelik Vocational School
²Niğde Ömer Halisdemir University, Department of Physics
³Akdeniz University, Department of Physics

songulozum@hitit.edu.tr / songulozum@gmail.com

Abstract: The magnetic hysteresis ($M-H$) and quadrupole hysteresis ($Q-D$) loops have been investigated for the Blume-Emery-Griffiths (BEG) model using the pair approximation. The observed curves strongly depend on biquadratic exchange interaction (K). Especially, $M-H$ loops show different and novelty properties from those which depend on negative D values. Besides, we presented the $M-D$ and $Q-H$ behaviors which are in good agreement with the other theoretical findings.

Keywords: Blume-Emery-Griffiths model, pair approximation, magnetic hysteresis, quadrupole hysteresis

Nanosized monolayer on the square lattice within spin-1 Ising Model: Hysteretic Properties with odd interactions

¹Ramazan Kavlak, ²Songül Özüm, ³Rıza Erdem, ⁴Orhan Yalçın
¹Hitit University, Institute of Science,
²Hitit University, Alaca Avni Çelik Vocational School
³Akdeniz University, Department of Physics
⁴Niğde Ömer Halisdemir University, Department of Physics

ramazankavlak@gmail.com

Abstract: We propose a theoretical framework for the investigation of M - H and Q - D hysteresis loops for the nanosized monolayer on the square lattice within spin-1 Ising model Hamiltonian with dipolar (J), quadrupolar (K), dipolar-quadrupolar (odd, L) interactions and single-ion anisotropy parameter (D) in pair approximation. We observed that the shift of these loops depends on K , D , temperature (T) and monolayer size (R). These are also discussed in relation with the experimental and theoretical findings.

Keywords: Nanosized square lattice, Pair approximation, Biquadratic interaction, Odd interaction, Hysteresis loops

On the use of carbon nanotubes in prototyping the high energy density Li-ion batteries

¹Meir Yerdauletov
¹Eurasian National University

meyir2008@mail.ru

Abstract: Energy storage technology based on lithium-ion electrochemical systems makes it possible to manufacture batteries with high specific energy and power densities. Over the past decades such batteries have been the most widely used ones in applications related to electric vehicles, portable electronics, and robotics. The main area of research aimed at improving the specific parameters of lithium-ion batteries is associated with the synthesis and study of new electrode materials and electrolytes providing higher specific lithium capacities and higher voltage. Moreover, lithium-ion battery specific parameters can be significantly improved by reducing the mass contribution of inactive components, as well as by controlling the microstructure of the electrode layers. The technological aspects of fabrication of high areal capacity LFP-based electrodes using the carbon nanotubes as conductive additives were considered. The influence of electrode slurry rheological properties and electrode composition on its areal (mAh cm⁻²), volumetric (mAh cm⁻³) and gravimetric (mAh g⁻¹) capacity and C-rate performance has been studied. The electrodes with 1% of the CNTs demonstrate a higher specific capacity compared with electrodes containing 5-15% of carbon black. However, increase in the CNT content up to 10% significantly lowers electrode volumetric capacity, which is even lower than for the electrodes with carbon black. SANS measurements revealed that the CNT network embedded in the electrode layer provides its greater wettability by an electrolyte compared to carbon black used as conductive additive. This results in better electrode C-rate performance. During fabrication of thick electrodes, it is necessary to take into account the rheological properties of the electrode slurry. Our results revealed that increase in the CNT mass content of more than 5% significantly complicates the process of their dispersion in a solvent and fabrication of thick homogeneous layers becomes problematic. Electrode calendaring improves the electrode volumetric capacity. In our case, the optimal compression rate is of 10% at a roll temperature of 100°C. It was demonstrated that using the CNTs as conductive additives opens prospect for fabrication of electrodes with areal capacity more than 5 mAh cm⁻². The practical applicability of the considered electrode technology was approved on the pouch cell prototype with specific energy density of 150 Wh kg⁻¹/295 Wh l⁻¹. The results of electrochemical measurements showed that an increase in the CNT mass fraction in the electrode composition leads to an increase in its C-rate performance. However, for the formation of thick and dense electrodes with a high areal capacity, it is necessary to take into account the rheological properties of the electrode slurry as well as the fact that during drying the electrode coating undergoes shrinkage due to evaporation of a solvent. Thus, it is important to maintain a balance between the mass ratio of the electrode components and their total content in a unit of solvent.

Keywords: Carbon nanotubes, pouch cell prototype, high areal capacity electrodes

The Investigation of Graphene Based Hybrid Structure for Solar Cell

¹Recep Zan, ¹Ali Altuntepe, ¹Serkan Erkan, ¹Mehmet Ali Olğar, ¹Ayşe Seyhan
¹Niğde Ömer Halisdemir University

recep.zan@ohu.edu.tr

Research on graphene has gained momentum in recent years due to graphene's remarkable properties such as high optical transmittance, high thermal conductivity, high charge mobility and high durability [1, 2]. Many theoretical and experimental studies showed that graphene film has various applications in solar cells [3]. It can be used as a transparent conductive electrode (TCE), catalytic counter electrode, active layer and charge transport layer in the solar cells. Gallium doped zinc oxide (GZO) is one of the TCE materials that can be used in Silicon-based solar cells. GZO has some superior properties namely high transmittance in visible region and stability over a period of time when compared to the other TCEs [4]. However, the sheet resistance of GZO is higher than the other commercial TCE materials, which necessitates the somehow decrease of the sheet resistance of the film to be applicable in Si-based solar cells. Therefore, in the present study, GZO films with different thickness (50 nm-500 nm) were produced by magnetron sputtering method and 350 nm film thickness was determined as the optimum film thickness to be used in solar cells. Then, grafen/GZO hybrid structure was fabricated to be employed in solar cells as TCE with the idea of increasing the cell efficiency. To do this, single layer graphene was transferred onto GZO coated cell structure which was then finished off with fabricating metal contacts. As a result, we have observed a reasonable increase in the cell efficiency thanks to this hybrid structure.

The authors gratefully acknowledge the funding from The Scientific and Technological Research Council of Turkey (TUBITAK-119M032).

Keywords: graphene, solar cell, thin film, ZnO, GZO

Raman spectroscopy study of damages induced in polycrystalline Si_3N_4 by swift heavy ion irradiation

A.K. Mutali^{1,2,3}, A.T. Zhumazhanova^{1,2}, A.D. Ibrayeva^{1,2,3}, V.A. Skuratov³, M.V. Zdorovets^{1,2,4}

¹ L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan

² The Institute of Nuclear Physics' Astana branch, Nur-Sultan, Kazakhstan

³ G.N. Flerov Laboratory of Nuclear Reactions of Joint Institute for Nuclear Research, Dubna,
Russia

⁴ Ural Federal University, Yeketerinburg, Russia

mutali@jinr.ru, ainashzhumazhanova@gmail.com, a.d.ibrayeva@gmail.com, skuratov@jinr.ru,
mzdorovets@gmail.com

Abstract. In this work the Raman spectroscopy method was used to study the radiation damage and associated internal mechanical stresses in polycrystalline silicon nitride (Si_3N_4). Si_3N_4 samples have been irradiated with swift heavy 167 MeV Xe and 710 MeV Bi ions with fluences ranged from $1\text{E}11$ to $4.87\text{E}13$ ions/cm². The cross-section and near surface spectra of the irradiated region were registered at room temperature. FWHM parameters - 205 cm^{-1} and peak position - 862 cm^{-1} were used to characterize the amorphization and the mechanical stress level.

Keywords: Raman spectroscopy, Silicon nitride, Swift heavy ions, Amorphization, stress.

Импульсная фотолюминесценция F_2^{2+} -центров окраски в Al_2O_3 , облученном быстрыми тяжелыми ионами

^{1,2}М.Маматова, ³Айбек Сейтпаев, ²В.А.Скуратов, ¹А.Даулетбекова

¹Евразийский национальный университет им. Л.Н. Гумилева, Нур Султан, Казахстан
²Лаборатория ядерных реакций им. Г.Н. Флерова Объединенного Института Ядерных Исследований, Дубна, Россия

³Астанинский филиал Института ядерной физики, Нур-Султан, Казахстан

kena3991@mail.ru

Abstract: В данной работе представлены и обсуждаются результаты анализа кинетики затухания люминесценции монокристаллов оксида алюминия, облученного ионами ванадия (51 МэВ), ксенона (167 МэВ) и висмута (710 МэВ). Излучение в максимуме полосы свечения F_2^{2+} -центров (560 нм) регистрировалось с временным разрешением 0,4 нс при возбуждении импульсом света длительностью 20 пс на длине волны 440 нм. Установлено, что время жизни возбужденных состояний составляет ~8 нс и не зависит от уровня радиационных повреждений, формируемых по каналу электронного торможения

Keywords: оксид алюминия, быстрые тяжелые ионы, фотолюминесценция, радиационные дефекты

PHYSICS&NUCLEAR TECHNOLOGY

Using of prompt-gamma neutron activation analysis to determine the elemental composition of archaeological ceramics: first results

^{1,3}A.Zh. Zhomartova, ^{1,2}S.B. Borzakov, ¹A.Yu. Dmitriev¹

¹Frank Laboratory of Neutron Physics, Joint Institute for Nuclear Research, Dubna,
Russia

²Dubna State University, Dubna, Russia

³L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan
zhomartova@jinr.ru

Abstract: The work is related to the preparation and conduct of experiments on the qualitative and quantitative elemental analysis of the studied samples. The first experiments were carried out to study the elemental composition of archaeological ceramics from excavations of the Bolgar (Republic of Tatarstan, Russian Federation) using the method of prompt-gamma neutron activation analysis (PGAA) on the channel equipped with mirror neutron guide at the IBR-2 reactor. The gamma quanta have been registered by radiation resistant HPGe detector.

PGAA is a completely non-destructive analytical method that allows you to study large samples without long-lasting sample preparation. After a short time after the end of the experiment, the samples are not active and could be returned to the owners. The non-destructive feature of the method makes it an excellent tool for studying the elemental composition of archaeological and other samples.

Mass fractions of more than 10 elements were determined. The obtained data were compared with the results of neutron activation analysis and X-ray fluorescence analysis for the same samples. The analysis showed a good coincidence of results, obtained by different methods. The directions of further development of PGAA at the IBR-2 reactor are defined.

Monitoring of the radiation-epidemiological state and morbidity of the workers of the uranium enterprise

^{1,2}M.Aumalikova, ^{1,2}D.Ibrayeva, ²K.Ilbekova, ^{3,4}E.Shishkina, ¹K.Zhumadilov

¹ L.N.Gumilyov Eurasian National University, Munaitpasova Str. 13, Nur-Sultan 010008, Kazakhstan

² Institute of Radiobiology and Radiation Protection NJSC "Astana Medical University", Beibitshilik Str. 49, Nur-Sultan 010000, Kazakhstan

³Ural Research Center for Radiation Medicine, Vorovsky Str. 68A, Chelyabinsk 454076, Russia

⁴Chelyabinsk State University, Bratiev Kashirinykh St 129, Chelyabinsk 454001, Russia

abulmalik.md@gmail.com

Abstract: Monitoring of radiation dose and health status of workers of the uranium processing hydrometallurgical plant of the Republic of Kazakhstan. The purpose of the work is to assess the dose load and the health status of workers of the uranium processing hydrometallurgical plant in order to develop measures aimed at reducing their incidence. This article presents the results of radiation monitoring and the health status of employees of the Hydrometallurgical Plant of the Stepnogorsk Mining and Chemical Combine. The data of the accumulated effective dose for the entire working experience, as well as data on the incidence for the period 2013-2019, obtained from the database of the Industrial Radiation and Epidemiological Register (further - IRER) were analyzed. Studies were carried out on the mass content of uranium in the urine of 54 HMP workers using an Agilent 7800 inductively coupled plasma mass spectrometer. Based on the results of these measurements, the expected effective internal dose of the plant was calculated. The health status of employees was assessed based on the materials of outpatient and hospital referrals, as well as the results of mandatory periodic medical examinations over the past 5 years. According to the results of this research, a 1.8 fold increase in the content of uranium in the urine from the "conditional norm" and an excess of the expected effective dose of internal exposure based on the analysis of a urine sample by 3 times were revealed. The most characteristic of the studied contingent of the main group were diseases of the eye and its adnexa (23%).

Keywords: Uranium in urine, Radiation dose, Mortality, Uranium workers

Research of radionuclide composition in the atmosphere in Akmola region

Zhumalina A.G.¹, Sakaguchi A.², Zhumadilov K.Sh.¹

¹International Department of Nuclear Physics, New Materials and Technology, L.N.Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan;

²University of Tsukuba, Tsukuba, Japan;

Abstract: The growth of the technical progress rate of development leads to the search for additional sources of energy, which in turn leads us to the use of nuclear energy, with its inevitable consequences of environmental pollution, in case of accidents of various kinds, including air pollution.

The lengthy tests of nuclear weapons at the Semipalatinsk testing area also left a mark on the map of events of ecological catastrophes of mankind and the people of Kazakhstan in particular.

The purpose of this work was to identify the impact of human activity on the atmosphere of Akmola region. Together with scientists from Hiroshima University and Tsukuba University, the aerosol composition in the air was monitored over the Nur-Sultan using an automated aerosol sampling station and a multistage cascade of impactors. The cascade of impactors is a device for Sampling in which particles collected from an aerosol accumulate on a series of storage plates, the deposition principle is used.

The first data obtained in the study of aerosol samples, using a cascade of impactors that allows to select aerosols up to 0.49 microns in size, showed the content of lead and cesium isotopes in the air of the city. On average, aerosols were collected from more than 200,000 cubic meters of air. In this case, the increase in the weight of the filter element used as a substrate in the stages of the cascade of the impactor was different, the smaller the transmission gap, the more particles were captured. It was also noted that the main isotope masses precipitate in the range from 1.4 μm to 0.49 μm .

In the winter season, in view of the lowering of the ambient temperature and the beginning of the heating season, as well as precipitation in the form of snow and soot, the surface of the filters has undergone severe contamination, well defined by visual inspection.

The study of radiation defects in heterostructured semiconductors after irradiation at the irradiation facility of the IBR2 research reactor

^{1,3}Yskakov.A, ¹Bulavin M, ²Vasil'evskii I, ³Zhumadilov K

¹Joint Institute of Nuclear Research

²National Research Nuclear University MEPhI

³Eurasian National University

almas.9@mail.ru

Abstract: Heterostructures of high quality A₃B₅ arsenides with a quantum well based on In-Ga_{1-y}As exhibit high mobility of a two-dimensional electron gas and are actively used in microwave heterostructure electronics. In the heterostructures, the current-conducting layer is very thin — of the order of 10–20 nm, enclosed between wide-gap barriers; therefore, the radiation physics of such structures may differ from what was done in classical bulk semiconductors. A set of samples with heterostructures were irradiated in the irradiation unit of the IBR-2 research reactor. Preliminary results on x-ray diffraction and Raman spectroscopy are obtained.

Keywords : Heterostructure, Semiconductor, Irradiation, X-ray diffraction

Radon levels on the territory mining activities in Stepnogorsk area, Kazakhstan

^{1,2}D. Ibrayeva, ^{1,2}M. Aumalikova, ²M. Bakhtin, ²P. Kazymbet, ²K. Ilbekova, ^{3,4}E. Shishkina, ¹K. Zhumadilov

¹L.N. Gumilyov Eurasian National University, Nur-Sultan 010008, Kazakhstan

²Institute of Radiobiology and Radiation Protection, nCJSC Astana Medical University, Nur-Sultan 010000, Kazakhstan

³Ural Research Center for Radiation Medicine, Chelyabinsk 454076, Russia

⁴Chelyabinsk State University, Chelyabinsk 454001, Russia

danaraibrayeva@gmail.com

Abstract: Mining activities performed sources of potential naturally occurring radionuclides contamination of the environment and human health of population. The aim of this study was to determine the radon concentration in the air in settlements' houses and territories and calculate the annual effective dose of population from radon on the territory mining activities in Stepnogorsk area.

The study has shown that activity concentrations of indoor radon in the buildings ranged from 8 to 870 Bq m⁻³ Aqsu and 3 to 540 Bq m⁻³ in Kvartsitka located close to former mining sites. The E_{inh} corresponding to the activity concentrations ranged from 1-27 mSv y⁻¹ received by the settlements' public. The highest value of E_{inh} in Aqsu school reaches up to 68 mSv y⁻¹ received by the critical group of public was found at the territory of former mining the Stepnogorsk area.

The results of this study show significant radiation hazards in Aqsu School which located at the territory of former mining site, and there is evidence of radon health risk to the members of the public.

Keywords: Radon concentration, Uranium mining, Gold mining, Effective dose, NORM.

T-odd effects in the binary fission of uranium induced by polarized neutrons

^{1,2}D.B. Berikov, ¹Yu.N. Kopatch, ²K.Sh. Zhumadilov, ^{1,3}G.S. Ahmadov, ^{1,4}V.V. Novitsky, ⁵A.M. Gagarsky, ^{1,4}G.V. Danilyan, ⁶V. Hutanu, ⁶J. Klenke, ⁶S. Masalovich, ⁷H. Deng

¹Joint Institute for Nuclear Research, 141980 Dubna, Russia

²L.N.Gumilyov Eurasian National University, 010000 Nur-Sultan, Kazakhstan

³National Nuclear Research Centre, Baku, Azerbaijan

⁴Institute for Theoretical and Experimental Physics of National Research Centre “Kurchatov Institute”, 117218 Moscow, Russia

⁵Petersburg Nuclear Physics Institute of National Research Centre “Kurchatov Institute”, 188300 Gatchina, Russia

⁶Forschungs-Neutronenquelle Heinz Maier-Leibnitz, D-85747 Garching, Germany

⁷RWTH Aachen University and JCNS at Maier-Leibnitz Zentrum, 85748 Garching, Germany
daniyar.berikov@gmail.com

Abstract: T-odd angular correlations in ternary nuclear fission (TRI and ROT asymmetries) were studied with the aim of finding a violation of Time Reversal Invariance (TRI) in neutron-nuclear interactions. A nonzero T-odd effect was discovered in an experiment to measure asymmetry in the emission of light charged particles in the ²³³U ternary fission (TRI effect), which was performed at a high-flux ILL nuclear reactor in Grenoble by the collaboration of Russian and European institutions. As it turned out, the effect is not associated with violation of T-invariance, but can be explained by a complex mechanism of the fission process. Later, the ROT effect was observed in the emission of prompt gamma-rays and neutrons in fission of ²³⁵U and ²³³U, although its magnitude was an order of magnitude smaller than in the emission of α -particles in ternary fission. All experiments up to now were performed with cold polarized neutrons, which suggests a mixture of several spin states of the compound nucleus, the relative contributions of which are not well known. Our work presents the results of the first experiments to measure the ROT effect in the fission of ²³⁵U by hot polarized neutrons at the POLI facility of the FRM2 reactor in Garching with neutron energies of 0.06 and 0.3 eV. The latter energy corresponds to the position of the first isolated resonance of ²³⁵U.

Keywords: T-odd effects, polarized neutrons, nuclear fission

Main characteristics of detectors for dosimetry of small photon fields of medical accelerators

¹R.A.Bakenova, ²E.S.Sukhikh, ¹K.Sh.Zhumadilov
¹L.N.Gumilyov Eurasian National University
²Tomsk Regional Oncology Center.

raikhan_ba86@mail.ru

Abstract: Dynamic irradiation techniques are widely used in modern radiotherapy. The required dose distribution in the area of interest is a superposition of a set of small fields. This leads to the fact that the size of many detectors used in clinics is too large compared to the size of the radiation field. Currently, the most common detectors are ionization chambers, semiconductor, film, and diamond and thermo luminescent detectors.

The following detector characteristics are mainly evaluated: leakage current, stability, linearity, dose rate dependence, dose dependence per pulse, volume effect.

The leakage current introduces additional uncertainty in the detector reading. The higher the leakage current, the more the measured value differs from the true value. To determine the leakage current, the accumulated charge is measured within one minute.

The stability of the detector indicates how often the detector needs to be calibrated. Low stability requires more frequent recalibrations and makes it impossible to use the detector to measure output factors. According to the recommendations of the TRS-483 Protocol (issued with the support of the IAEA/AAPM) on static small field dosimetry for radiotherapy, the stability of the detector readings should be better than 0.1%. The linearity of the detector readings relative to the dose is estimated by the formula:

$$NL = \frac{\sum_{i=1}^n \frac{1}{n-1} \left(\left(\frac{M_{det_i}}{M_{ref_i}} \right)^2 - \left(\frac{M_{det}}{M_{ref}} \right)^2 \right)}{\left(\frac{M_{det}}{M_{ref}} \right)} \times 100\% \quad (1)$$

where M_{det_i} is the detector reading, and M_{ref_i} is the reference camera reading for the i -th measurement. The NL coefficient characterizes the average relative deviation from the unit of the ratio of the detector readings in the measurement range. According to the recommendations of the TRS-483 Protocol, linearity should be higher than 0.1% in the range of absorbed doses that differ by more than 3 orders of magnitude.

The volume effect is expressed in the fact that the detector measures the absorbed dose in a certain area, averaging it over the entire sensitive measurement volume.

Detectors are mainly used in which the excess response caused by perturbations of surrounding materials is compensated for by the insufficient response caused by volume averaging. This compensation method depends on the situation and cannot be generalized. Therefore, it can be assumed that a detector used for dosimetry in large fields will not work well in small fields until the opposite is confirmed by its adequate characteristic, specifically designed for use in small fields.

Keywords: Dosimetry of small fields, Ionization chambers, Semiconductor detectors

Impact of ionizing radiation emitted by the objects of the uranium industry on the forest ecosystem in the village of Saumalkol

¹Zhantore Isa, ¹Kassym Zhumadilov
¹Eurasian National University after L.N. Gumilev

isazhantore@gmail.com

Abstract: This article contains research mechanism and findings of investigation on how far ionizing radiation generated by local uranium mining facility had an effect on flora and fauna of surrounding forests and lakes. Aim of research is to find evidences of hazardous effects of ionizing radiation on nearby biocenosis or absence of such effects. Article gains in importance in connection with the decisive attitude of Kazakhstan to provide the IAEA with platforms for the placement of low-enriched uranium and, as a result, increased caution of environmentalists

Keywords: ionizing radiation, biodiversity, mutation, ecosystem, radiation dose control, radiation safety management

Investigation of the fast neutron $6\text{Li}(n,t)4\text{He}$ and $10\text{B}(n,\alpha)7\text{Li}$ reactions

A.O. Assylova^{1,2,3}, Yu.M. Gledenov³, E. Sansarbayar³, I. Chuprakov^{1,2,3}

¹ L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan,

² The Institute of Nuclear Physics, Almaty, Kazakhstan

³ Frank Laboratory of Neutron Physics of Joint Institute for Nuclear Research, Dubna, Russia

assylova@jinr.ru

Abstract. This paper discusses the reactions with emission of charged particles (n,t) and (n,α). Such reactions are of great interest in the field of reactor construction, nuclear structure and astrophysics. Reactions $6\text{Li}(n,t)4\text{He}$ and $10\text{B}(n,\alpha)7\text{Li}$ were measured using a twin gridded ionization chamber (IC) with a common cathode. Fast neutrons were produced through the $^{241}\text{Am}/\text{Be}$. The working gas of the chamber was Kr + 3% CO₂. The absolute neutron flux was determined using a ^{238}U sample installed inside an ionization chamber, and a long counter He3 was used as a neutron flux monitor and for normalization. The presented detector and method, from our point of view, are optimized for research of (n,α) reactions at energies 1-10 MeV and allow one to obtain both power spectra and angular distributions of reaction products.

Keywords: ionization chamber, neutron source, detector, neutron flux.

Estimation of doses of internal alpha-irradiation of tooth enamel by EPR spectroscopy

¹Bauyrzhan Abyshev, ²Alexander Ivannikov, ¹Kassym Zhumadilov

¹L.N. Gumilyov Eurasian National University, Munitpasova 13, Nur-Sultan, Kazakhstan.

²A.F. Tsyb Medical Radiological Research Center, 10, Marshal Zhukov str., Obninsk, Russia.

baurzhan.abyshev@gmail.com

Abstract: The social significance of dosimetric methods and protocols for their application is due to the need for scientific and methodological support and dosimetric support of medical and preventive measures by identifying people with high doses of radiation. EPR spectroscopy of tooth enamel samples makes it possible to determine the dose of ionizing radiation absorbed in the enamel by the amplitude of the radiation-induced signal from the paramagnetic centers formed in the mineral component of the enamel (hydroxyapite). From the value of radiation induced EPR signal in the samples, the total accumulated radiation doses in enamel were estimated and excess doses were obtained after subtraction of the contribution of the natural radiation. Effects due to alpha irradiation for group were investigated by comparison of dose in enamel measured by EPR before and after removal of the surface layer of enamel samples by acid etching.

Keywords: EPR, Dosimetry, Alpha-irradiation, Enamel

The Preliminary results of NEDA Phototubes : Measurements performed in İstanbul

¹Sefa ERTÜRK, ²M. Nizamettin ERDURAN, ³Ferhat ÖZOK, ³Taylan YETKİN, ⁴Aslı YETKİN, ⁵Emre İREN, ²Oktay DOĞANGÜN and NEDA Collaboration

¹Department of Physics, Nigde Ömer Halisdemir University

²Department of Computer Engineering, Sabahattin Zaim University, İstanbul, TURKEY

³Department of Physics, Mimar Sinan Fine and Art University, İstanbul, TURKEY

⁴Department of Energy System Engineering, İstanbul Bilgi University, İstanbul, TURKEY

⁵Vocational School, İstanbul Arel University, İstanbul, TURKEY

sefa@ohu.edu.tr

Abstract: Production of exotic nuclei has been the favourite topic last decades. Reaction channel selectivity is very important; in order to extract reaction channel precisely ancillary detectors are used. For example charged particle detectors (DIAMANT, CsI, SSDs etc) and neutron detectors (NWall, NEDA etc) are used extensively at nuclear research facilities across Europe, and will be essential instrumentation at radioactive beam facilities under construction as SPIRAL2 at GANIL (France), SPES at LNL (Italy), ISOLDE at CERN (Switzerland) and FAIR at Darmstadt (Germany). In this presentation we will concentrate on NEDA (NEutron Detector Array) is a collaborative European project to construct a modern Neutron Detector Array for performing experiments with stable and radioactive ion beams. NEDA will be composed of 300 to 400 detectors in the future, covering a solid angle of about 2π and will be used as an ancillary detector of large gamma-ray arrays such as AGATA, EXOGAM2, GALILEO and PARIS spectrometers using both intense stable beams as well as radioactive ion beams. The reaction channel selectivity can be achieved through the detection of all, or at least as many as possible, decay products. Therefore, the combination of neutron and charged particle detectors is of high importance. The Preliminary results of NEDA Phototubes Measurements performed in İstanbul and partial results from the experiment of $N = Z = 50$ isospin symmetry breaking and pairing experiments performed in France will be presented.

Важность интегрируемого дискретного нелинейного уравнения Шредингера

А. А. Мейрманова¹, Г. М. Оразбаева², Н.С. Серикбаев³

¹ докторант Евразийского национального университета имени Л.Н.Гумилева,
г.Нур-Султан, Казахстан

² магистрант Евразийского национального университета имени Л.Н.Гумилева,
г.Нур-Султан, Казахстан

³PhD, и.о. доцента, Евразийский национальный университет имени Л.Н.Гумилева, г. Нур-Султан, Казахстан

Аннотация: В этой статье рассматриваются нелинейные системы Шредингера являются важными примерами физически значимых нелинейных эволюционных уравнений, которые могут быть решены методом обратного преобразования рассеяния (МОЗР). Фактически, МОЗР для дискретных и непрерывных, а также скалярных и векторных систем нелинейных систем Шредингера вписываются в одну и ту же структуру, которая рассматривается здесь. Используя подход МОЗР, можно явно построить солитонные решения каждой из этих систем, а также формулы, по которым можно определить динамику взаимодействия солитонов. Здесь мы даем полное представление о важности интегрируемого дискретного нелинейного уравнения Шредингера, чтобы производить логические вычисления.

Ключевые слова: Дискретное решение, интегрируемое уравнение, солитон, нелинейное уравнение Шредингера, метод обратной задачи рассеяния

DWBA calculations of proton transfer in the nuclear reaction $14\text{N} + 12\text{C}$

^{1,2,3}A.K. Azhibekov, ¹K.A. Kuterbekov, ¹A.M. Kabyshev, ³A.M. Mukhambetzhani
¹L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan
²Joint Institute for Nuclear Research, Dubna, Russia
³Korkyt Ata State University, Kyzylorda, Kazakhstan
azhibekoaidos@mail.ru, kkuterbekov@gmail.com, assetenu@gmail.com,
aisulumuhankyzy@mail.ru

Abstract: The proton transfer in the reaction $12\text{C}(14\text{N},13\text{C})13\text{N}$ are discussed. Calculations of level energies in the shell model of deformed and spherical nuclei are performed for 14N nuclei. The present theoretical analysis of the $12\text{C}(14\text{N},13\text{C})13\text{N}$ reaction at 116 MeV was performed by means of the FRESKO code. Our theoretically calculated differential cross sections give a fair description of the experimental data for the proton transfer reaction.

Keywords: DWBA method, shell model, deformed and spherical nuclei, proton transfer.

Radon safety problems in Akmola region

A. Bagramova, K.Sh. Zhumadilov, M. Hoshi

¹L.N.Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan

²Hiroshima University, Hiroshima, Japan
assel.yaf.enu@gmail.com

Abstract: Currently, the content of radon in residential buildings has become a matter of concern for the health of the population.

²²²Radon is potentially the most significant source for radiation exposure in residential buildings, because its half-life is long enough to allow it to accumulate indoors and because ²³⁸U can be present in relatively high concentrations in the ground. ²²²Radon is constantly released from the ground as a result of the radioactive decay of ²²⁶Ra. In the great majority of cases, the main source of ²²²Rn indoors is the ground under the building. Building materials can also be a source of ²²²Rn indoors, although they are usually of much less important origin than ground.

Many studies have been conducted on this basis. Measurement of the radioactivity of radon and its decay products was carried out with a "Ramon-02" radon radiometer. According to the results of these studies, it was found that the radon activity in residential buildings near the uranium province of Northern Kazakhstan in the Akmola region is higher than normal. And this contributes to the development of lung cancer and other serious diseases.

The purpose of the article is to investigate the danger of radon and show methods for preventing radon pollution of air in residential buildings.

Keywords: Radon, Products of decomposition, radiation exposure, Lung cancer.

Лабораторная подготовка кварцсодержащих образцов, отобранных и экспонированных на территории Акмолинской области

¹Сарсенова С.М., ²Степаненко В.Ф., ³Жумадилов К.Ш.

¹ Докторант 3-го курса Международной кафедры ядерной физики, новых материалов и технологий Евразийский национальный университет им. Л.Н.Гумилева, Нур-Султан, Казахстан,

² Доктор биологических наук, профессор, заведующий Лабораторией медико-экологической дозиметрии и радиационной безопасности Медицинского радиологического научного центра им. А.Ф. Цыба, Обнинск, Россия,

³ PhD, заведующий Международной кафедрой ядерной физики, новых материалов и технологий Евразийский национальный университет им. Л.Н.Гумилева, Нур-Султан, Казахстан

nuclei_dsm20@mail.ru

Аннотация: Для нашего исследования в качестве образцов для ретроспективной дозиметрии были взяты речной песок и красный отоженный кирпич, в состав которых входит кварц (SiO₂). Кристаллы кварца являются природными накапливающими люминесцентными дозиметрами. В данной работе описывается методика лабораторной подготовки кварцсодержащих образцов для проведения люминесцентных измерений. Исследования методом ретроспективной дозиметрии проводятся на территории Акмолинской области Республики Казахстан. На территории данной области находятся населенные пункты (Степногорск, Кварцитка, Аксу, Заводской), вблизи которых добывается и перерабатывается природный уран. Образцы речного песка предварительно были подготовлены к экспозиции, затем экспонированы на объектах повышенного радиационного риска и в близлежащих к ним населенных пунктах. Образцы красного кирпича были отобраны в городе Степногорске. Процесс лабораторной подготовки включает в себя несколько этапов. Основная цель – выделение микрокристаллов кварца для проведения люминесцентных измерений. После подготовки образцов проводились люминесцентные измерения, для этого использовалась система ТЛД-считывателя.

Ключевые слова: радиационно-обусловленная люминесценция, кварц, речной песок, красный кирпич, накопленная доза.

BUILDING TECHNOLOGIES: Modern Architectural Designs, Intelligent Cities/Buildings

Tasarım ivmelerinin 2007 ve 2019 deprem yönetmeliği zemin sınıflarına göre deęişimi

Dr. Hakan Karaca
Niğde Ömer Halisdemir Üniversitesi, Mimarlık Bölümü

karaca26@hotmail.com

2019 itibarı ile yürürlüğe girmiş olan Türkiye Bina Deprem Yönetmeliği (TBDY-2019) ile zemin parametrelerinde çok önemli yenilikler getirilmiş ve zemin-yapı etkileşiminin daha gerçeğe yakın modellenebilmesini mümkün hale gelmiştir. Zeminin özellikle büyütme ve küçültme etkisinin yeni şartnamede yer alması, yönetmeliğin bilimsel verilere daha uygun hale gelmesini sağlamıştır.

Bu kapsamda, TBDY-2019'dan resmi olarak yürürlüğe girmeden önce yürürlükte olan Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik (DBYBHY-2007) kapsamında yapıların tasarımında kullanılan tasarım ivmeleri ile yeni deprem şartnamesine göre uygulanacak tasarım ivmelerini karşılaştırılması yapılmış ve Kapadokya bölgesi illerinin il merkezlerinde zemin koşullarına bağlı olarak tasarım ivmelerinin ne kadar artıp azaldığını belirlenmiştir.

Anahtar Kelimeler: Türkiye bina deprem yönetmeliği, Zemin sınıfları, Tasarım ivme spektrumları, Zemin büyütmesi, Deprem

Tek tesirli yapıştırma bağlantılarında bindirme uç geometrisi değişiminin dayanıma etkisinin gerilme ve hasar analizleriyle sayısal olarak araştırılması

İsmail Saraç, Semih Benli
Aksaray Üniversitesi Mühendislik Fakültesi Makine Mühendisliği Bölümü
ismailsarac@aksaray.edu.tr, semihbenli@aksaray.edu.tr

Özet: Yapıştırma bağlantıları birçok mühendislik alanında kullanılmaktadır. Birleştirilecek parçalarda herhangi bir delme işlemine gerek olmaması ve farklı özellikteki malzemelerin kolaylıkla birleştirilebilmesi yapıştırma bağlantılarının önemli avantajlarından biridir. Bazı tasarım değişiklikleri ile yapıştırma bağlantılarının dayanımını artırmak mümkündür. Bu çalışmada, ANSYS sonlu elemanlar analiz programı kullanılarak farklı bindirme uç geometrilerine sahip tek tesirli yapıştırma bağlantı modelleri oluşturulmuştur. Daha sonra, farklı bindirme uç geometrilerinin bağlantı mukavemetine etkisini araştırmak için gerilme ve hasar analizleri yapılmıştır. Oluşturulan bağlantıların sonlu eleman hasar yüklerini bulmak için maksimum gerilme teorisi kullanılmıştır. Analizler sonucunda referans modele göre önemli dayanım artışları tespit edilmiştir. Model-3 (iç konik) ve Model 5 (iç girintili) tasarımlarının referans modele göre dayanım artışları, sırasıyla % 80 ve % 67 olarak hesaplanmıştır.

Anahtar Kelimeler: Yapıştırma bağlantıları, Bindirme uç geometrisi, Gerilme analizi, Hasar analizi

On the issue of renovation in Nur Sultan City

¹T.V. Zhussupov, ²Sh.Zh. Zharassov, ³Ye.B. Utepov
L.N. Gumilyov Eurasian National University

¹timurvictorovich@gmail.com, ²Zhshzh95@gmail.com, ³utepov-elbek@mail.ru

Abstract: At present, Kazakhstan is implementing state programs that address the issues of dilapidated housing. The program of renovation and demolition of dilapidated housing includes a huge pool of issues from different areas. All issues must be taken into account when implementing the program of renovation for comfortable living and rational use of resources. It is proposed to use geoinformation systems to develop a methodology for the renovation of dilapidated housing.

Keywords: Renovation, Geoinformation systems, Real Estate Fund, Demolition of shabby housing.

Effects of Different Factors on Concrete Strength gain

Author Name: Zharassov Sh.Zh., Zhussupov T.V., Utepov Ye.B.

Author's Institutional Information: L.N. Gumilyov Eurasian National University

Author's E-mail Address: Zhshzh95@gmail.com, timurvictorovich@gmail.com, utepov-elbek@mail.ru

Abstract: The relationship between internal and external factors of strength gain of concrete was investigated. Meanwhile, sensors analyzed phase composition and structure characteristics of samples before and after strength gain. Research results demonstrate that temperature, moisture, relative humidity and aggressive environment influence the strength gain and compressive strength of concrete significantly. There is a linear relationship between internal and external factors, as well as the compressive strength of concrete. The temperature, moisture, relative humidity and aggressive environment present a power and a polynomial function. The concrete strength gain increases with the increase of relative humidity and reaches the maximum value when the relative humidity is 70%. Significant differences of phase composition and structure are observed before and after strength gain.

Keywords: Concrete, strength gain, temperature, moisture, relative humidity, compressive strength.

Energy-saving technologies for the production of building materials using solar energy in the Republic of Kazakhstan

Aruova L.B.¹, Dauzhanov N.T.²

¹Doctor of Technical Sciences, Professor, Eurasian National University named after L.N. Gumilev, Kazhimukan 13, r.205, ²Candidate of technical Sciences, Associate Professor, Eurasian National University named after L.N. Gumilev, Kazhimukan 13, k.205
ecoeducation@mail.ru

Abstract. The article is devoted to the issues of energy and resource saving in the production technology of building materials using solar energy. An analysis of the production of building materials is given as one of the important sectors of the country's economy. This sector of the economy is characterized by high consumption of energy resources, production costs and a high level of material consumption. The problem of finding new sources of energy is one of the most important and the further development of all industries in all countries of the planet depends on it. The authors have developed innovative technologies for using solar energy for heat treatment of various types of concrete. The results of research on the use of solar energy through systems with an intermediate heat transfer agent, through solar power systems, as well as through the direct use of the sun at landfills using translucent chambers for such types of building materials as ordinary concrete, polystyrene concrete, wood concrete, foam concrete and others are presented. Physical and mechanical properties of various concretes, such as compressive strength, frost resistance, modulus of elasticity, etc. made by innovative technologies are 30-40% higher than the strengths of concrete made by traditional technologies. The use of solar energy for heat treatment of various concretes is a new energy-efficient promising direction, developed by university scientists. The use of solar technology makes it possible to save 50-100% of traditional fuels, an environmentally friendly environment, without emissions from fuel combustion, high quality and low cost of concrete products and structures. All developed technologies are aimed at reducing the environmental impact, energy and resource saving and achieving a high level of quality of life of the population. In general, the university's science development formula in the new decade sees in the scientific provision of high technologies the development of economic sectors through the introduction of their own and borrowing technologies to create scientific foundations, technological structures ensuring the sustainable development of Kazakhstan in the future.

Keywords: energy efficiency, resource saving, solar energy, concrete, wood concrete, foam concrete, temperature, humidity

Integration of Modern Public Spaces into The Urban Materia of The City of Nur-Sultan

Kamilla Argyngazina
Scientific advisor, professor Chekaeva Rakhima
L.N. GUMILYOV EURASIAN NATIONAL UNIVERSITY
kamillaarg@gmail.com
rahima.chekaeva@mail.ru

Abstract: The socio-cultural significance of public places plays an important role in the life of the city and in the life of each of its inhabitants from early years to old age. After all, these places are zones of leisure, sports, recreational and social purposes. This study examines the principles of formation, ease of use and relevance of public spaces in the city of Nur-Sultan. In the article, the objects of research and analysis are open public spaces, which include squares, pedestrian promenades, arbats, playgrounds, parks, squares, sports grounds, embankments and other spaces that are functionally oriented towards recreational and public purposes. For the study, the city of Nur-Sultan was selected as a dynamically developing, modern city of the 21st century, where there are enough open public spaces, from historically formed to modern ones. As part of the concept of the master plan "Nur-Sultan - a comfortable city", more than 50 public spaces are currently being developed and improved. Thus, work was carried out on the conservation and renovation of historical public places and projects for new spaces were developed, with unique and modern approaches to urban design. The main purpose of the study and research is contemporary public spaces that meet the requirements of the level of comfort for a person, indicators of which are accessibility, architectural and landscape appearance, condition, functionality and safety, as well as the connection of these objects with the city, their demand in the city matter. Also, an approach to the formation and integration of modern public spaces into the urban environment is investigated on the basis of existing precedents. Analysis of project practices and the success of the selected examples allows us to conclude about the relevance of this study, the demand for specific zones by users of these territories with their local context, as well as future trends in its further formation and development.

Keywords: public spaces, urbanism, landscape, urban planning practice, public zones.

Potential dam site characterization using geographical information system

Timoth Mkilima

Department of Civil Engineering, L.N. Gumilyov Eurasian National University, Satpayev street
2, 010000, Nur-Sultan, Kazakhstan

Department of Environmental Engineering, Ardhi University, Dar es Salaam, Tanzania
tmkilima@gmail.com

Abstract: Unanticipated changes in stormwater characteristics have led to many dam failures in the world, as well as affecting the performance of flood control structures. The land surface cover is among the significant factors in determining the characteristics of stormwater runoff. Unfortunately, this fact has been highly ignored in the design processes of dams. This study investigated the potential influence of land surface cover on dam sites stormwater runoff; for the case of Msimbazi catchment in Dar es Salaam, Tanzania. The Soil Conservation Service–Curve Number (SCS-CN) method was used for the runoff estimation as it takes into account land surface properties. Digital Elevation Model (DEM) for the Msimbazi catchment was used to extract the boundaries of the catchment and delineate the streams networks with the help of the Geospatial Hydrologic Modeling Extension (HEC-GeoHMS) in ArcGIS. With having a basic knowledge of the study catchment, the unsupervised approach was used for the land surface cover analysis from Landsat images. The dam sites were then compared in terms of their size, land surface cover properties, and their stormwater runoff yield. The results derived from this study, reveals further the usefulness of RS and GIS-based techniques in the assessment of potential dam sites as part of the engineering, catchment management, and decision-making practices.

Keywords: Dam site selection, DEM, Flow discharge, GIS, Urban catchment

The impact of technological progress on architecture

Chekayeva Rakhima, Igibayeva Malika
L.N. Gumilyov Eurasian National University
malika-takira@bk.ru

Abstract: The research focuses on the impact of technological progress on stylistic trends in architecture, as well as new modern information methods that facilitate the workflow for architects. The main purpose is to demonstrate the connection between available opportunities and creative ideas. It is also necessary to prove that stylistic trends in architecture can develop independently from the sphere, by creating myriad forms of information presentation, such as films, TV series, multi-platform games, etc. It is required to show the indirect influence of computer games, as well as alternative methods of educating society from childhood, where they can learn the basic norms of architecture, in contrast to past centuries without technology. The positive impact of VR and AR technologies on the visual formation process. And also the possibility of using these methods in future real architectural projects.

Keywords: Architecture, Vr, development, future, development.

Қазақстанда құрылыс саласында энергия тиімді технологияларды қолдану.

Автордың аты-жөні : Өтегенова Жанерке Өтжанқызы.

**Автордың жұмыс орны : Еуразия ұлттық университеті, сәулет-құрылыс факультеті,
ғимараттар мен имараттарды жобалау кафедрасының магистрі.**

Автордың почтасы (e-mail) : j.utegen@mail.ru.

**Ғылыми жетекші: Сарсекеева Гульнар Сапарбековна
Жұмыс орны: Еуразия ұлттық университеті, сәулет-құрылыс факультеті,
техникалық ғылымдар кандидаты, доцент.**

Түйіндеме: Құрылыс саласы елдің эконимкасы және халықтың әл-ауқаты үшін маңызды салалардың бірі болғандықтан, ғимараттарда максималдық жайлылыққа қол жеткізу және коммуналдық шығындарды барынша азайту мақсатында олардың энергия тиімділігін арттыру мемлекет үшін маңызды мәселердің бірі болып табылады. Сол себептен де, құрылысты жобалау кезінде мемлекеттің энергияны тиімді қолдануға бағытталған бағдарламаларын қолдану, оның барысын қадағалау тиісті органдардан талап етіледі. Қазақстанда энергия тиімді технологиямен салынған жобалар қарапайым жобалардан бағасы жағынан қаншалықты өзгешеленетіні және осындай ғимараттарды жобалаудың тиімділігі осы статьяда қарастырылатын болады.

Тірек сөздер: энергия тиімділік, энергия үнемдеу.

Forming “Smart Cityspaces” on the example of Kazakhstan cities

Sara Sadykova, Olga Semenyuk, Sabina Kuc, Gulman Moldaliyeva
L.N. Gumilyov Eurasian National University, Architecture and Construction Faculty, Street
Kazhymukan 13, Nur-Sultan, 010000, Republic of Kazakhstan
sadykova_ssh@enu.kz

Abstract: The article discusses topical issues related to global urbanization processes around the world. Modern trends in the formation of "smart urban spaces" are highlighted on the example of Nur-Sultan. The significance of the problem discussed in the article is revealed in the foreword; the main part includes specific examples that show the main aspects of the development of a smart city. On the example of the complex of EXPO 2017 and urban infrastructures of Nur-Sultan, the issues of smart energy supply, smart transport system, smart communal services, smart buildings and apartment houses are considered. In conclusion, the main prospects for the further development of smart city systems in the infrastructure of Nur-Sultan are revealed.

Keywords: Smart city, energy efficiency, specialized exhibition, green energy, urban spaces.

Land gradation with fuzzy logic method in land consolidation projects

Ela Ertunç

Konya Technical University, Faculty of Engineering and Natural Sciences, Department of
Geomatics Engineering, Selçuklu-Konya, Turkey
eertunc@ktun.edu.tr

Abstract: Land consolidation (LC) is an effective land management approach used to increase agricultural production, ensure food security, improve modern agriculture and sustainable development, and prevent land fragmentation. The most important stages of these projects are land gradation and land reallocation. Because the amount of land to be reallocated depends on the grading of agricultural plots. After consolidation in the project area, in order to give the land equal to the previous land, the existing parcels should be graded according to certain criteria.

This study has aimed to develop an expert system that will optimize land gradation. In the study, the Fuzzy Logic (FL) method has used in land gradation according to the Agricultural Reform Law on Land Arrangement in Irrigation Areas numbered 3083. The soil point, asset point, road and settlement point values used in determining the parcel unit value are defined as input and the parcel unit value is defined as output in the Fuzzy Logic method. Membership functions have created for inputs and outputs, converted into linguistic expressions and a rule base has created according to expert opinions. In order to test the model, real project values have entered into the system and the results have compared. The result of the study has showed that the Fuzzy Logic method can be used in land gradation studies.

Keywords: Land gradation, Fuzzy Logic, Land consolidation, Land value.

Façade solutions trends in Nur-Sultan

Abdrakhmanova Dina Oraztayevna
abdrakhmanova_dina@list.ru

Abstract: The article is devoted to the study of the development of facade solutions, starting with the appointment of Tselinograd as the capital of Kazakhstan, and their impact on the modern appearance of the city, as well as the shaping of modern building facades and their aesthetic perception in the context of urban development. Although now the design of facades is reaching another significantly qualitative level, still not all architects manage to preserve and present the national style.

Purpose: systematization and study of trends in the development of facade solutions and their impact on the mentality of people.

Keywords: Facade solutions, Building materials, Mentality of the society

Development of Local Geotechnical Information Database in Hachinohe and Use for Earthquake and Liquefaction Countermeasures

Akira Hasegawa 1, Kenji Kaneko 2 and Yutaka Hashizume 3

1 Emeritus Professor, Hachinohe Institute of Technology, JAPAN

2 Professor, Hachinohe Institute of Technology, JAPAN

3 Associated Professor, Hachinohe Institute of Technology, JAPAN

Ahasegawa0402@gamil.com

kaneko@hi-tech.ac.jp.

hashizume@hi-tech.ac.jp

Abstract: In 1980's, the authors had developed the Hachinohe local geotechnical information database (1980HDB), however they were not able to keep managing it. In 2009, the authors developed the renewal version of HDB using Web-GIS and common format for geotechnical database in Japan. The construction of HDB clarified the issues for continuous managing. In the development of HDB, the system was designed with the prospect of locality, general trend, sustainability, and utilization of it. And, a 2009HDB local organization to keep managing was established at the same time. Now 2009HDB had have more than 2600 data of boring log. Three key points to maintain the HDB continuously are common format of database, establishment of organization and automatic upload method of new boring logs.

In this paper, the outline of the development of 2009HDB and a few studies using 2009HDB for earthquake and liquefaction countermeasures are described. In the use for earthquake and liquefaction countermeasure, consideration on the correlation between water pipe damage, liquefaction index calculated from 2009HDB, and ground conditions is described.

Keywords: Geotechnical information, Database, Web-GIS, Earthquake, liquefaction, PL Value

Модульдік темірбетон қадаларын сынап және сараптау

Елеусіз А.Б., Омаров А.Р., Исаков С.Б. Жусупбеков А.Ж.
Л.Н. Гумилев атындағы Еуразия ұлттық университеті
lamabzaleusiz@gmail.com; omarov_01@bk.ru; sultan.iskak@mail.ru; astana-geostroi@mail.ru

Түйіндеме: Жүк көтергіштігі дәстүрлі интерпретация әдістерін қолдана отырып, статикалық жүктемеге қадаларды сынау деректері негізінде анықталды. Нәтижелер стандартты әдіс бойынша аналитикалық есептеулердің деректерімен және қадаларды қағу бойынша статистикалық деректермен салыстырылды. Ең үлкен жүк көтергіштігі Чиннің интерпретациялау және Декурдың экстраполяциялау әдістерімен алынғандығы көрсетілген. ДеБир, Дэвиссон, Фуллер және Хой әдістерінің нәтижелері ұқсас болды. Батлер мен Хойдың интерпретация әдісінің нәтижесі сынақ нәтижелеріне ұқсас болды. Қазақстандық стандартты әдісімен алынған қадалардың көтергіштік қабілеті біршама жоғары болды. Жұмыста қолданылатын әдістер далалық жағдайларда орнатылатын қадалардың жүк көтергіштігін бағалау үшін практикалық ұсыныстар бола алады.

Тірек сөздер: модульдік қада, сазды топырақ, динамикалық сынау, интерпретация әдістері.

Статические испытания свай в соответствии с требованиями ГОСТ

**Искаков С.Б., Омаров А.Р., Жусупбеков А.Ж., Елеусіз А.Б., Қайыпқанова Н.М., Ауесхан Г.
Б.**

**Евразийский национальный университет имени Л.Н. Гумилева
sultan.iskak@mail.ru; omarov_01@bk.ru; astana-geostroi@mail.ru;
lamabzaleleusiz@gmail.com; Nurizat228@gmail.com; Baykeldin@mail.ru**

Аннотация: В статье представлены нагрузочные испытания свай диаметром 820 мм и длиной 13,5 м на строительной площадке в новой столице Республики Казахстан. Испытание на статическую нагрузку свай является наиболее надежным методом для определения взаимодействия между нагрузкой и осадкой свай. В настоящей статье представлены результаты статических испытаний свай с использованием сжимающую нагрузку (по ГОСТ).

Ключевые слова: свай, домкрат, прогибомер, монумент.

Electronic textbook with animazing cheratists on the program turbo site

Sadykova Zhanna¹, Yeziyeva Mariyam²
¹Eurasian National University, ²Akdeniz University
sjm67@mail.ru

Abstract: In this article authors offer methods of development of electronic textbooks, with the detailed description of the designer, about how to prepare animation on projection tasks, what presentation and video editors to use for preparation of drawings and multimedia materials, how to develop tests on discipline. In other words, the authors are completely open. I paint methods of development of the textbook on disciplines of engineering graphics and descriptive geometry.

The use of the electronic textbook speeds up the search for information and mobilizes it. Animation makes a material accessible for understanding, besides in the textbook there are materials for practical training and there are materials promoting its decision. The authors of the article for plotting and animation have shot Camtasia Studio video editor from the screen with PowerPoint software. In Camtasia Studio software, tasks of descriptive geometry in the sequence of the solution were shot, national background music promoting reflection and rhythm plays on a roll.

The textbook itself was performed in the TurboSite constructor. The textbook project and its concept were thought over. The main purpose of developing the electronic textbook is to create an easy, accessible material to activate the cognitive activity of students in engineering graphics and descriptive geometry [Sadykova, 2010].

For an estimation of the electronic textbook authors conducted experiment in two groups among students of design, architecturally-building faculty, the L.N. Gumilyov Eurasian national university.

Technologies are developed because everyone, using the degree of their resources and awareness in these technologies, tries to improve their services for the sake of competitiveness, thus becoming the engine of modern technologies. Education in its logical level should be in the forefront of all technologies, so to improve the presentation of their subjects, invent easy and affordable methods of learning for the student is the main task of a modern teacher.

Keywords: TurboSite website, PowerPoint, Camtasia Studio, video, design, engineering graphics, drawing, electronic textbook

Modern architectural design with a focus on inclusive features

Berdyugina Darya Alekseevna, D. Begimbay K. M.
L. N. Gumilyov ENU, Nur-Sultan, Kazakhstan
bedryugina2018@mail.ru

Abstract: Modern architecture requires a lot of attention. Great development in this area provides great opportunities. This article describes the features of modern architecture and natural materials. In addition, the connection between architecture and exclusive design and people with disabilities. State programs that support various areas of design provide an opportunity for the development of all areas of this industry.

Keywords: Modern, architecture, design, materials, inclusive.

TRANSPORTATION AND ENERGY: Hybrid/Electrical Vehicles, Renewable Energy Systems

A novel EKF based algorithm with the estimation of rotor angular velocity and stator resistance for the position-sensorless control of AC PMSMs

Murat Barut

**Niğde Ömer Halisdemir University, Department of Electrical and Electronics Eng.
mbarut@ohu.edu.tr**

Abstract: In this paper, a novel extended Kalman filter (EKF) based position-sensorless estimation algorithm is introduced to the literature for the position-sensorless control of permanent magnet ac synchronous motors (PMSMs). The proposed algorithm is able to perform the online estimations of the stator currents, the rotor angular velocity, and stator resistance by assuming that measured stator currents and voltages are available.

The obtained computer based simulation results under challenging variations in rotor angular velocity, stator resistance, and load torque demonstrate the effectiveness of the introduced EKF based algorithm.

Keywords: Permanent Magnet Synchronous Motor, position-sensorless control, extended Kalman filter, speed estimation, stator resistance estimation.

Dizel-benzin-etanol karışımı sıkıştırma ateşlemeli altı silindirli turbo şarjlı bir motorda supap zamanlaması optimizasyonu

Ramazan ŞENER
Batman Üniversitesi
ramazan.sener@batman.edu.tr

Özet: Günümüzde sıkıştırma ateşlemeli motorlar, yüksek termal verimi ve güvenilirliği dolayısıyla yaygın olarak kullanılmaktadır. Yüksek performans ve düşük emisyon elde etmek için alternatif yakıtlar kullanılmaktadır. Bu çalışmada, %80 dizel, %10 benzin ve %10 etanol karışımı yakıt kullanan altı silindirli turbo şarjlı sıkıştırma ateşlemeli bir motorun supap zamanlamaları bir boyutlu model ve genetik algoritma kullanılarak optimize edilmiştir. Optimizasyon çalışmasında, supap zamanlamaları değiştirilirken, diğer motor çalışma koşulları sabit tutulmuştur. Toplam 500'e yakın farklı egzoz, emme supap zamanlaması ve supap yüksekliği değeri simüle edilmiştir. Optimizasyon sonucunda, motor gücü %4 oranında artmıştır. Elde edilen optimum supap zamanları ile pompalama kayıpları da minimize edilerek ve fren motor gücü, torku maksimize edilmiştir. ÖYT değeri de %4 civarında azalarak motorun yakıt ekonomisi artmıştır. Ayrıca motor dayanımı ve ömrü için önem arz eden, silindir içi maksimum basınç değeri de optimum supap zamanlamaları ile %5 oranında azalmıştır.

Anahtar Kelimeler: : İçten yanmalı motorlar, supap zamanlaması, optimizasyon, dizel-benzin-etanol yakıt karışımı.

Extreme Learning Machine Kullanarak Rüzgâr Güç Tahmini

Tuba TANYILDIZI AĞIR
Batman Üniversitesi, Meslek Yüksek Okulu.
tuba.tanyildiziagir@batman.edu.tr

Özet: Teknolojinin gelişmesi, fosil kaynakların azalması, çevre kirliliği gibi etmenler yenilenebilir enerji kaynaklarına olan talebi artırmıştır. Rüzgâr enerjisi doğada bol bulunması ve temiz bir enerji kaynağı olması gibi nedenlerden dolayı son yıllarda çok tercih edilir. Rüzgâr gücü doğru tahmin edilirse işletme maliyeti azalır, güç kalitesi ve güç sisteminin kararlılığını artırır. Bu çalışma da Yalova'da bulunan bir rüzgâr türbininin gücünü tahmin etmek için Extreme Learning Machine (ELM) yöntemi kullanılmıştır. Rüzgâr türbinine ait şu veriler kullanılmıştır: rüzgâr yönü, rüzgâr hızı, teorik güç eğrisi ve rüzgâr gücü. Bu veriler 2018 yılına ait olup her 10 dakika aralıklar ile ölçülmüştür. Bu verilerin ortalama günlük verileri çalışmamızda kullanılmıştır. ELM'nin gizli düğüm sayıları 20-200 arasında değerler verilerek ortalama kare hata (Mean Square Error, MSE), kök ortalama kare hata (Root Mean Square Error, RMSE), eğitim zamanı, eğitim doğruluğu, test doğruluğu elde edilmiştir. ELM algoritmasında gizli nöron sayısı 20 seçilirse en iyi eğitim doğruluğu 0.0258 ve en kısa eğitim süresi 0.00042 elde edilmiştir. Ayrıca nöron 40 iken 0.000154 MSE, 0.0124 RMSE ile en az hata değerini elde etmiştir. Simülasyon sonuçları nöron sayısı arttıkça aşırı öğrenmeye gittiğini ve yüksek hata verdiğini göstermiştir. İlaveten nöron sayısı eğitim doğruluğunu, test doğruluğunu, eğitim zamanını ve test zamanını etkilemiştir.

Anahtar Kelimeler: Extreme Learning Machine, Rüzgâr gücü, Ortalama kare hata, Eğitim doğruluğu, Eğitim zamanı.

Extreme learning machine ile güneş panelinin günlük güç tahmini

Tuba TANYILDIZI AĞIR
Batman Üniversitesi, Meslek Yüksek Okulu
tuba.tanyildiziagir@batman.edu.tr

Özet: Yenilenebilir enerji kaynaklarına olan ihtiyaç teknolojinin gelişmesi ile birlikte 21. yüzyılda artmıştır. Güneş enerjisi mevcut elektrik senaryoları için bir alternatiftir. Güneş enerjisinin kullanımı enerji tasarrufu, hava kirliliği ve maliyet gibi pek çok konuda avantaj sağlar. Fakat güneş enerjisinin kesintili doğasından dolayı doğru güç tahminine ihtiyaç duyulmuştur. Doğru bir Fotovoltaik (FV) güç tahmini güç şebekelerinin kontrolünde önemli bir rol oynar. Bu çalışmada bir evin günlük enerji ihtiyacını karşılayan bir güneş panelinin gücünü tahmin etmek için Extreme learning machine (ELM) kullanılmıştır. ELM'de 20-100 nöron için ortalama kare hata (Mean Square Error, MSE), kök ortalama kare hata (Root Mean Square Error, RMSE), determinasyon katsayısı (coefficient of determination) değerleri elde edilmiştir. Simülasyon sonuçları nöron 60 için MSE 0.0000000022, RMSE 0.000047 ve 0.9893 ile en iyi değeri elde etmiştir. Ayrıca güneş enerjisinin aylık ortalama güç değeri tahmin edilmiş ve hata miktarı hesaplanmıştır. ELM algoritması güneş enerjisini hesaplarken iyi bir performans göstermiştir.

Anahtar kelimeler: Extreme learning machine, Güneş enerjisi, Ortalama kare hata, Kök ortalama kare hata, Determinasyon katsayısı.

Optimal Control of a Quadrotor

¹Sevinç Günsel, ¹Yorgo İstefanopulos, ¹Erkin Dinçmen

¹Isik University

svncgns1@gmail.com, yorgo.istefanopulos@isikun.edu.tr, erkin.dincmen@isikun.edu.tr

Abstract: Quadrotors are unmanned aerial vehicles (UAVs) used widely and these vehicles have been controlled with different controllers, such as PID, Linear Quadratic Regulator (LQR). In this study, the linear state-space model is developed according to quadrotor's kinematic and dynamic equations, and LQR controller is designed for tracking a given trajectory. The system is designed in five different ways by using MATLAB/Simulink. Designs are examined for both continuous-time and discrete-time cases. In addition, a Kalman estimator is added to the design for the LQR controller. The simulation results of the controller performances for each design are compared. According to the results, the LQR controller achieves the best performance for trajectory tracking.

Keywords: Quadrotor, LQR, trajectory tracking, control

Improved Speed-Sensorless Field-Oriented Controlled Induction Motor Drive With Feed-Forward Control of Load Torque

Rıdvan Demir¹, Emrah Zerdali²

¹Mechatronics Engineering Dept., Nigde Omer Halisdemir University, Nigde, Turkey

²Electric Electronics Engineering Dept., Nigde Omer Halisdemir University, Nigde, Turkey
ridvandemir@ohu.edu.tr, ezerdali@ohu.edu.tr

Abstract: This study presents an improved field oriented controlled (FOC) induction motor (IM) drive with feed-forward control (FFC) of load torque. For this purpose, the required rotor fluxes, rotor mechanical speed, and load torque for speed-sensorless FOC are estimated by an extended Kalman filter (EKF), which uses the measured stator voltages and currents as inputs. Thus, using only one observer, disturbances caused by unknown load torque changes are rejected without the use of any speed sensor, and the performance of speed-sensorless FOC-based IM drive is considerably increased. The proposed speed-sensorless IM drive is tested by challenging scenarios in simulations. The results obtained demonstrate the effectiveness of the improved speed-sensorless FOC-based IM drive with FFC of load torque.

Keywords: Induction motor, extended Kalman filter, field-oriented control, feed-forward control, state/parameter estimation

Delay-dependent stability analysis of a single-area load frequency control system enhanced by electric vehicles aggregator and demand response control

Ausnain NAVEEDA, Deniz Katipoğlu^b, Şahin SÖNMEZ^c, Saffet AYASUN^d

^aDepartment of Electrical and Electronics Engineering, Nigde Ömer Halisdemir University,
Nigde, Turkey

^bDepartment of Electrical and Electronics Engineering, Aksaray University, Aksaray, Turkey

^cDepartment of Electronic and Automation, Malatya Turgut Özal University, Malatya, Turkey

^dDepartment of Electrical and Electronics Engineering, Gazi University, Ankara, Turkey

husnain.naveed@gmail.com, denizkatipoglu1@gmail.com, ssonmeztr@gmail.com,
saffetayasun@gazi.edu.tr

Abstract: This paper investigates the impact of time delays on the stability of a single-area load frequency control (LFC) system that includes electric vehicles (EVs) and demand response (DR) control. Energy storage devices such as EVs and responsive loads for DR control are becoming promising tools for the frequency control and power grids stability. However, an open and dedicated communication networks used to send and receive control signals cause inevitable time delays which can degrade the performance of the controller and lead to undesired oscillations in the system frequency. Therefore, it is essential to compute stability delay margins for a stable operation of the single-area LFC system with EVs and DR control. By implementing a simulation approach, this paper determines stability delay margins for a wide range of the proportional-integral (PI) controller gains of the single-area LFC system with EVs and DR control.

Keywords: Load frequency control, Stability delay margin, Demand Response, Electric vehicles.