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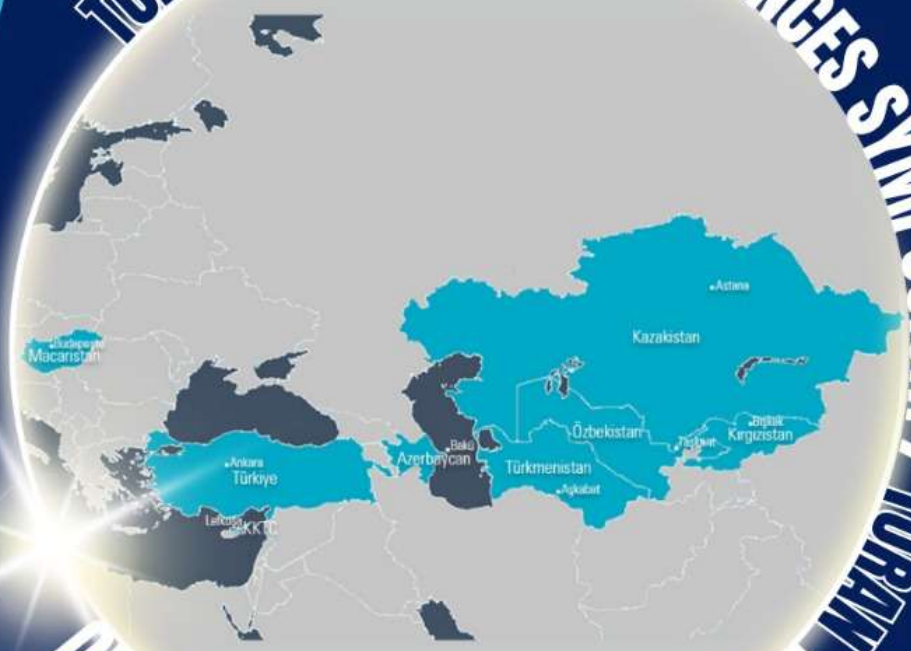
YTÜ FEN EDEBİYAT FAKÜLTESİ

YTÜ FACULTY of ARTS and SCIENCES

TURAN FUNDAMENTAL SCIENCES SYMPOSIUM / TURAN TEMEL BİLİMLER SEMPOZYUMU



TURAN25

BOOK OF ABSTRACT
BİLDİRİ ÖZET KİTAPÇIĞI

JUNE 23-24-25 2025

İSTANBUL/TÜRKİYE

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YTÜ FEN EDEBİYAT FAKÜLTESİ YTÜ FACULTY of ARTS and SCIENCES

TURAN-FUNDAMENTAL SCIENCES SYMPOSIUM
TURAN-TEMEL BİLİMLER SEMPOZYUMU

Honorary Chair/Onursal Başkan: Prof. Dr. Aziz SANCAR

TURAN-Fundamental Sciences Symposium

TURAN-Temel Bilimler Sempozyumu (TURAN25)

Book of Abstract

Bildiri Özet Kitapçığı

June 23-24-25, 2025

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ÖNSÖZ

Temel bilimlerin, bilimin merkezi olduğu; bilimsel keşiflerden teknolojik yeniliklere, mühendislik uygulamalarından endüstriyel çözümlere kadar hayata değer katan her gelişmenin dayanağını oluşturduğu ve insanlığın yarınlarını şekillendirmede kilit rol oynadığı tartışmasız bir gerçektir. Günümüzde, söz konusu gerçeğin toplumsal ve akademik düzeyde yeniden benimsenmesi; bilimsel ilerleme kavramının doğru biçimde tanımlanması ve teknolojik yeniliklerin tek başına bilimsel gelişme sayılmasının yanlış olduğunun altının çizilmesi büyük önem taşımaktadır. Zira bugün ortaya çıkan her teknolojik yenilik, aslında geçmişte yapılmış kapsamlı temel bilim araştırmalarının ve bu alanda biriken bilginin sonucudur. Temel bilimler araştırmalarının ve eğitiminin bu hayati önemi göz ardı edildiğinde, geleceğin bilimini üretme ve geleceğin teknolojilerini geliştirme potansiyeli daha bugünden yok olmaya başlayacaktır. Bu noktada temel bilimlere hak ettiği saygınlığın yeniden kazandırılması amacıyla yürütülecek girişimlerde, tüm paydaşların sorumluluk üstlenmesi büyük bir gerekliliktir.

Temel bilimlere öncelik verilmesinin önemini her fırsatta dile getiren, 2015 Nobel Kimya Ödülü sahibi Prof. Dr. Aziz Sancar'ın Onursal Başkanlığında, Yıldız Teknik Üniversitesi Fen Edebiyat Fakültesi bünyesinde düzenlenen Uluslararası TURAN Temel Bilimler Sempozyumu (TURAN25), söz konusu gereklilik çerçevesinde şu amaçlarla gerçekleştirilmiştir: temel bilimleri gerek ülkemizde gerek Türk dünyasının genelinde güçlendirme ve gelecekteki bilimsel ve teknolojik gelişmelere öncülük ve liderlik etme vizyonu doğrultusunda, temel bilimlerin önemine yönelik farkındalığı artırmak üzere Fakültemizce ulusal ölçekte yürütülen faaliyetleri Türk Devletleri ile başlayarak uluslararası ölçekte genişletmek; Türk Devletleri arasında temel bilimler alanında gerçekleştirilebilecek ikili anlaşmalara, projelere, araştırma ve eğitim faaliyetlerine zemin hazırlamak ve böylece ülkemiz ile diğer Türk Devletleri arasında siyasi, kültürel, ekonomik ve askeri düzeydeki işbirliklerinin yanı sıra yürütülmekte olan bilimsel iş birliklerine somut katkı sunmak ve Türk Dünyası ile birlikte tüm insanlık için bilim yoluyla fayda ve değer üretmek hedefiyle çıkılacak tarihi bir yolculuğun ilk adımını hep birlikte atmak.

Türk dünyasında ortak değerler etrafında yükselen güçlü bir akademik dayanışmayı temsil eden TURAN25, aralarında Almanya, Azerbaycan, Cezayir, Çin, Kazakistan, Kırgızistan, Macaristan, Özbekistan, Rusya ve Türkiye'nin bulunduğu 10 ülkedeki 50 farklı üniversiteden biyoloji, fizik, kimya ve matematik alanlarında çalışan bilim insanlarını buluşturmuş; Sempozyum kapsamında 6 çağrılı konuşma, 71 sözlü bildiri ve 47 poster sunumu gerçekleşmiştir. Sempozyum'da ayrıca Kapanış

Oturumu kapsamında "İkili İş birlikleri Paneli" gerçekleştirilmiş; temel bilimlerde uluslararası bilimsel iş birliğini güçlendirmenin, kurumsallaştırmanın ve sürdürülebilir kılmanın yolları tartışılmış ve aşağıda sunulan Sonuç Bildirisi hazırlanmıştır.

TURAN25, Türkiye Yüzyılı vizyonumuz çerçevesinde, temel bilimlerin bilimsel gelişme bağlamındaki önemine dair ulusal düzeyde güçlü bir farkındalık oluşturmak ve temel bilimler eğitiminin, günün ve geleceğin gereksinimleri doğrultusunda yeniden yapılandırılmasına öncülük etmek amacıyla Yıldız Teknik Üniversitesi Fen-Edebiyat Fakültesi bünyesinde gerçekleştirdiğimiz kapsamlı çalışmaların bir parçasıdır. Söz konusu çalışmalar çerçevesinde, yeni nesil bir temel bilimler eğitimi modeli ortaya koymak ve böylece temel bilimler öğrencilerine uluslararası standartlarda bir eğitim sunmak amacıyla "YTÜ-FEF Temel Bilimler Eğitimi Modeli" hayata geçirilmiştir. Temel bilimler bölümlerinde öğrenim gören öğrencilerin yalnızca nitelikli birer bilim insanı ve araştırmacı değil, aynı zamanda özel sektörde yüksek istihdam edilebilirliğe sahip Ar-Ge uzmanları olarak yetişmelerini hedefleyen bu Model, öğretim planlarının güncellenmesini; öğretim planlarının tamamına, Yapay Zekâya Giriş, Temel Bilgisayar Teknolojilerine Giriş, Kariyer Planlama ve Mesleki Etik ile Sosyal Sorumluluk ve Adalet derslerinin Zorunlu Fakülte Dersleri olarak eklenmesini; ayrıca temel bilimler öğrencilerinin disiplin-içi ve disiplinlerarası bilimsel uzmanlıklarını derinleştirmelerine imkân tanıyan yenilikçi sertifika programlarının oluşturulmasını ve farkındalık çalışmalarının gerçekleştirilmesini kapsamıştır.

Temel bilimlerin toplum nezdinde değerini görünür kılmak ve temel bilimlerin gerçekte ne olduğuna dair kavrayışı güçlendirmek üzere yürütülen farkındalık çalışmaları bağlamında, lise öğrencileri için YTÜ Fen-Edebiyat Fakültesi Temel Bilimler Farkındalık Çalıştayları düzenlenmiş; bu çalıştaylarla lise öğrencilerinin ve öğretmenlerinin temel bilimlerin anlamını ve değerini doğru kavramaları, gençlerin üniversite ortamında temel bilimleri yakından tanıyarak bilinçli tercihler yapmaları amaçlanmıştır. Lisans düzeyinde yürütülen farkındalık çalışmaları ise temel bilimler öğrencilerinin daha eğitimleri sırasında kendilerini bilim insanı olarak tanımlamaya başlamalarını ve bu kimliği içselleştirmelerini amaçlamıştır. Öğrencileri bilimsel araştırmaya teşvik eden bu faaliyetler arasında Lisans Bitirme Tezi Poster Sunumları, akademisyenlerin bilimsel araştırmalarını öğrencilerle paylaşmasına imkân tanıyan Fakülte Çarşamba Seminerleri ve farklı üniversitelerden lisans öğrencilerinin TÜBİTAK 2209-A/B projelerini sunduğu 2209A/B Fen ve Matematik Öğrenci Çalıştayları yer almıştır. Bu sayede öğrencilerin, ulusal ve uluslararası temel bilimler topluluğunun bir parçası olduklarını hissetmeleri ve alanlarına aidiyet geliştirmeleri hedeflenmiştir.

TURAN25, temel bilimlere ve temel bilimler eğitimine dair Fakültemizce ulusal ölçekte yürütülmekte olan söz konusu çalışmaların, Türk dünyasından başlayarak uluslararası ölçekte genişletilmesi yönünde atılmış güçlü bir adım olmuştur. Bilimsel iş birliklerinin sürdürülebilir şekilde güçlendirilmesi fikri gerek katılımcılarımız gerekse toplumun çeşitli kesimlerince büyük bir heyecanla karşılanmıştır. Bu bağlamda yapılan değerlendirmeler sonucunda, Sempozyumun geleneksel hale getirilmesi, ikincisinin 2027 yılında yine Fakültemiz bünyesinde düzenlenmesi, sonraki yıllarda farklı Türk devletlerinin ev sahipliğinde devam ettirilmesi, Türk dünyasında temel bilimlere ilişkin farkındalığı artırabilmek üzere Yıldız TURAN Akademisi kurulması ve temel bilimler alanına yüksek düzeyde bilimsel katkı yapan bilim insanlarını onurlandırmak için Nobel Ödülüne benzer bir "TURAN Temel Bilimler Ödülü" verme sürecinin başlatılmasına karar verilmiştir.

TURAN25'in, Türk devletleri arasında kalıcı ve güçlü bilimsel iş birliklerine ve Türk dünyasının gelecekte temel bilimler araştırmaları ve eğitimine yön verecek potansiyelini gerçekleştirmesine vesile olmasını diliyor, temel bilimlere gönül vermiş tüm bilim insanlarını şimdiden TURAN27'ye davet etmekten büyük bir onur ve mutluluk duyuyorum.

Saygılarımla,

Prof. Dr. Salim YÜCE

Sempozyum Başkanı

Yıldız Teknik Üniversitesi Fen Edebiyat Fakültesi Dekanı

11 Temmuz 2025

SEMPOZYUM ONURSAL BAŞKANIMIZ PROF. DR. AZİZ SANCAR'IN MESAJI

Türk Dünyasının Değerli Bilim İnsanları,

Değerli Kardeşlerim,

Öncelikle Yıldız Teknik Üniversitesi, Fen Edebiyat Fakültesi tarafından düzenlenen "**TURAN Temel Bilimler Sempozyumu**"nda sizlere hitap etmekten büyük bir kıvanç duyduğumu ifade etmek istiyorum.

Türk Dünyası'nın temel bilimler alanında çalışmalar yürüten bilim insanlarını buluşturmak ve Türk devletleri arasındaki bilimsel iş birliklerini güçlendirmek amacıyla gerçekleştirilen bu sempozyumun çok kıymetli bir girişim olduğunu düşünüyorum.

Bu tarihi günde aranızda fiziksel olarak bulunamadığım için çok üzgünüm. Orada sizlerle olmayı, sizlerle kucaklaşmayı çok isterdim. Ancak uzakta da olsam kalbim sizlerle.

Türkler olarak tarihteki şanlı günlerimize tekrar erişmemizin ve dünyada söz sahibi olmamızın yegâne yolu, en yüksek standartlarda bilim yapmak ve bilimde kuvvetli olmak. Bunun için de bilimin merkezi olan temel bilimlerde güçlenmemiz bir zorunluluk.

Bugün gerçekleştirilen TURAN Temel Bilimler Sempozyumu işte bu yüzden çok önemli ve değerli. Her birinize katılımınız için çok teşekkür ediyorum.

Sempozyumun, Türk Dünyasındaki bilimsel güç birliğine büyük katkılar sağlamasını diliyor, başta Yıldız Teknik Üniversitesi, Fen Edebiyat Fakültesi olmak üzere Sempozyumun düzenlenmesinde emeği geçen herkesi yürekten tebrik ediyor, her birinizi saygı ve sevgiyle selamlıyorum.

Prof. Dr. Aziz SANCAR

Sempozyum Onursal Başkanı

2015 Nobel Kimya Ödülü Sahibi

North Carolina Üniversitesi Biyokimya ve Biyofizik Bölümü, ABD

TABLE OF CONTENTS

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Research Assistant Vildan YILMAZ, Yıldız Technical University, Türkiye

INVITED PLENARY SPEAKERS

İ. Halil KAVAKLI, Can We Target the Core Clock Mechanism for the Treatment of Different Diseases?, Biology

Bilal BİLALOV, Some Questions of X-valued Elliptic Equations, Mathematics

Salim ÇERÇİ, CERN Today: Pushing the Boundaries of Particle Physics, Physics

INVITED SPEAKERS

Kemal Yavuz ATAMAN, Maveraünnehir, Horasan, Harezm Havzasında Muhtelif İlimlerin Birlikte Gelişmesi, Meşhur Alimlerin Yetişmesi, Kıymetli Eserlerin Yazılması Üzerine Bir Analiz, Tarih

Amir MOSAVİ, A Decade of Machine Learning Research: Evaluation Metrics, Taxonomies and Bibliometrics Analysis, Artifical Intelligence

Ferman MAMEDOV, On the L_1 data Dirichlet problem for the nonuniform Parabolic Equations of Second Order, Mathematics

ULUSLARARASI TURAN TEMEL BİLİMLER SEMPOZYUMU SONUÇ BİLDİRİSİ

Yıldız Teknik Üniversitesi Fen Edebiyat Fakültesi bünyesinde, 2015 Nobel Kimya Ödülü sahibi Prof. Dr. Aziz Sancar'ın Onursal Başkanlığında 23-25 Haziran 2025 tarihleri arasında düzenlenen Uluslararası TURAN Temel Bilimler Sempozyumu (TURAN25) kapsamında, Türk devletlerinde temel bilimler alanında çalışan bilim insanları İstanbul'da bir araya gelmiştir.

Aralarında Almanya, Azerbaycan, Cezayir, Çin, Kazakistan, Kırgızistan, Macaristan, Özbekistan, Rusya ve Türkiye'nin bulunduğu 10 ülkedeki 50 farklı üniversiteden biyoloji, fizik, kimya ve matematik alanlarında çalışan bilim insanlarının katıldığı Sempozyumun üçüncü gününde (25 Haziran 2025) Kapanış Oturumu kapsamında "İkili İşbirlikleri Paneli" gerçekleştirilmiştir.

Panel'de, Fen Edebiyat Fakültesi Dekanı ve Sempozyum Başkanı Prof. Dr. Salim Yüce, Sempozyumun, Yıldız Teknik Üniversitesi Fen Edebiyat Fakültesi bünyesinde, temel bilimler eğitiminin geleceğini inşa etmeye yönelik yürütülmekte olan çalışmaların çok önemli bir parçası olduğunu ifade etmiştir. Yüce, Sempozyumun, temel bilimlerin farklı alanlarından bilim insanlarının bir araya getirdiğini ve bu anlamda tarihte bir ilk olduğunu vurgulamıştır.

Yüce, Sempozyumun amacının, temel bilimlerin gerek ülkemizde gerek Türk Dünyasının genelinde güçlendirilmesi ve gelecekteki bilimsel ve teknolojik gelişmelere öncülük ve liderlik etme vizyonu doğrultusunda, temel bilimlerin önemine yönelik farkındalığı artırmak üzere Yıldız Teknik Üniversitesi Fen Edebiyat Fakültesi bünyesinde ulusal ölçekte yürütülen faaliyetleri Türk Devletleri ile başlayarak uluslararası ölçekte genişletmek; Türk Devletleri arasında temel bilimler alanında gerçekleştirilebilecek ikili anlaşmalara, projelere, araştırma ve eğitim faaliyetlerine zemin hazırlamak ve böylece ülkemiz ile diğer Türk Devletleri arasında siyasi, kültürel, ekonomik ve askeri düzeydeki işbirliklerinin yanı sıra yürütülmekte olan bilimsel iş birliklerine somut katkı sunmak ve Türk Dünyası ile birlikte tüm insanlık için bilim yoluyla fayda ve değer üretmek hedefiyle çıkılacak tarihi bir yolculuğun ilk adımını hep birlikte atmak olduğunu söylemiştir.

Yapay zekâ çağının, toplumun her kesimi için olduğu kadar üniversiteler için de çeşitli meydan okumaları beraberinde getirmekte olduğunu, üniversitelerin "yeni bilgi üretme" ve "yeni bilgi üretecek mezunlar yetiştirme" potansiyelinin yeni bir bakış açısıyla ele alınmak zorunda olduğunu vurgulayan Yüce, bu bağlamda temel bilimler eğitiminin yeniden düşünülmesine gereksinim olduğunu dile getirmiştir.

Yüce, temel bilimler eğitiminin 21. yüzyılda yeniden yapılandırılmasına yönelik yenilikçi bir çerçeve sunan ve Fen Edebiyat Fakültesi bünyesinde geliştirilip uygulamaya konmuş olan yeni nesil "YTÜ FEF Temel Bilimler Eğitimi Modeli"nin, temel bilimlerin, bilimin merkezi olduğu fikrini yeniden tesis etmeyi, temel bilimler eğitiminin niteliğini sürdürülebilir şekilde artırmayı, öğrencilere temel bilimler alanında uluslararası standartlarda yetkinlik ile birlikte disiplinlerarası uzmanlaşma kazandırmayı ve hepsinin ötesinde, toplumsal ve insani fayda odaklı araştırma ve bilgi üretimini merkeze alan bütüncül bir eğitim yaklaşımını hayata geçirmeyi hedeflediğini ifade etmiştir

Azerbaycan Milli Bilimler Akademisi Üyesi ve Eski Milli Eğitim Bakanı Prof. Dr. Misir Mardanov, Türk devletlerindeki değerli bilim insanlarını bir araya getiren ve farklı temel bilimler alanları arasındaki bilimsel etkileşime ve paylaşıma olanak tanıyan TURAN25 Sempozyumunun tarihi ve çok değerli bir girişim olduğunu ve bu kapsamdaki faaliyetlerin güçlendirilmesi, yaygınlaştırılması ve sürdürülebilir kılınması gerektiğini vurgulamıştır. Prof. Dr. Salim Yüce'nin liderliğinde geliştirilmiş ve uygulamaya konmuş olan "YTÜ FEF Temel Bilimler Eğitimi Modeli"nin, temel bilimler eğitiminde yeni bir istikamet gösterdiğini, gelecekte üniversitelerin değişip dönüşeceğini ve bu bağlamda özellikle Model kapsamında geliştirilen ve uzmanlaşmayı hedefleyen yenilikçi sertifika programlarının kritik önem taşıdığını, temel bilimler öğrencilerine alan bilgisi ile birlikte uygulamaya dönük beceri ve yetkinlikler kazandırmanın geleceğin eğitim faaliyetleri açısından çok önemli olduğunu ifade etmiştir.

Panel'de, TURAN25 Sempozyumunda ilk adımı atılmış olan, Türk devletleri arasındaki bilimsel güç birliğini sürdürülebilir şekilde inşa etmenin ve geliştirmeye yönelik girişimlerin ilerletilmesine yönelik yürütülen tartışmalar ve yapılan değerlendirmeler sonucunda,

1. TURAN25 Temel Bilimler Sempozyumunun her iki yılda bir düzenlenerek geleneksel hale getirilmesine,
2. Sempozyumun ikincisinin çok daha geniş bir katılımla 2027 yılında, yine Yıldız Teknik Üniversitesi Fen Edebiyat Fakültesi bünyesinde ve liderliğinde düzenlenmesine,
3. Tüm Türk devletlerinde TURAN27 kapsamındaki çalışmaları yürütmek üzere bilim komiteleri oluşturulmasına,
4. Oluşturulacak bilim komitelerinin faaliyetlerinin Yıldız Teknik Üniversitesi Fen Edebiyat Fakültesi tarafından koordine edilmesine,
5. TURAN27 Sempozyumuna katılımın artırılmasına, özellikle genç bilim insanları ve doktora öğrencilerinin katılıma güçlü biçimde teşvik edilebilmeleri için önlemler alınmasına ve düzenlenecek Sempozyumda genç bilim insanlarını, alanında deneyimli ve kıdemli bilim insanları ile buluşturacak Atölye Çalışmaları gibi uygulamaların gerçekleştirilmesine,
6. Sempozyuma katılım gösteren ülke temsilcilerinin Sempozyum ile ilgili değerlendirmelerini içeren yazılı bir rapor hazırlamalarına, bu raporu YTÜ FEF Sempozyum Düzenleme Kuruluna sunmalarına ve Sempozyum kapsamında yürütülen çalışmalara ilişkin olarak kendi ülkelerinde en yüksek düzeyde bilgilendirme ve tanıtma faaliyetlerinde bulunmalarına,
7. Temel bilimler alanına yüksek düzeyde bilimsel katkı yapan bilim insanlarını onurlandırmak için bir "TURAN Temel Bilimler Ödülü" verme sürecinin başlatılmasına,
8. Temel bilimlerin Türk dünyasında güçlendirilmesine yönelik çalışmaların öncülüğünü yapan Yıldız Teknik Üniversitesi Fen Edebiyat Fakültesi bünyesinde temel bilimler kapsamında araştırma ve eğitim faaliyetlerine yön verecek bir Yıldız TURAN Akademisi kurulmasına yönelik çalışmalar yapılmasına,

9. Geleceğin temel bilimler eğitimini inşa etmek üzere "YTÜ FEF Temel Bilimler Eğitimi Modeli"nin diğer Türk devletlerindeki üniversitelerde de yaygınlaştırılması yönelik çalışmalar yürütülmesine ve Türk devletleri arasında bu kapsamda akademik değişim programları ve iş birlikleri oluşturulmasına,

10. TURAN Temel Bilimler kapsamındaki tüm bu çalışmaların, faaliyetlerin ve ileriye dönük planların tüm Türk devletlerindeki üst düzey yetkililer ile paylaşılmasına ve bu çalışmaların sürdürülebilirliğini ve en yüksek düzeyde fayda üretmesini sağlamak üzere devlet desteğinin talep edilmesine karar verilmiştir.

25 Haziran 2025

Prof. Dr. Salim YÜCE

Sempozyum Başkanı
Fen Edebiyat Fakültesi Dekanı
Yıldız Teknik Üniversitesi

Prof. Dr. Misir MARDANOV

Azerbaycan Cumhuriyeti Bilim ve Eğitim Bakanlığı
Matematik ve Mekanik Enstitüsü Müdürü

INVITED PLENARY SPEAKERS ABSTRACTS

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Can We Target the Core Clock Mechanism for the Treatment of Different Diseases?

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Circadian rhythm is an intrinsic timing system that enables organisms to anticipate and adapt to daily environmental changes, regulating physiological processes such as the sleep-wake cycle. This rhythm is controlled by a molecular circadian clock mechanism driven by a transcriptional and translational feedback loop (TTFL). In mammals, TTFL is orchestrated by the interaction of four key clock proteins: BMAL1, CLOCK, Cryptochromes (CRY), and Periods (PER). BMAL1 and CLOCK form dimers that bind to E-box elements in promoter regions, initiating the transcription of clock-controlled genes (CCGs). Disruption of circadian rhythm has been linked to various diseases, including diabetes, sleep disorders, and neurological conditions. For a long time, it was unclear whether targeting the core clock mechanism could offer therapeutic benefits. Our research, employing in silico, in vitro, and in vivo methods, has identified several small molecules that modulate core clock components. These molecules have demonstrated potential therapeutic effects in animal models for various diseases. In this talk, I will highlight these recent advancements and their implications for disease treatment.

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TURAN-FUNDAMENTAL SCIENCES SYMPOSIUM
TURAN-TEMEL BİLİMLER SEMPOZYUMU
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Some Questions of X-Valued Elliptic Equations

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We consider X-valued elliptic equations with scalar coefficients. First, we provide a brief overview of results obtained in this direction. Then, some new results concerning the solvability problems of X-valued elliptic equations are presented, when X has the so-called Unconditional Martingale Difference (UMD) property. We demonstrate the main scheme for establishing the Fredholmness (or Noetherness) of the considered equations in X-valued Sobolev spaces. Furthermore, we establish interior Schauder-type estimates for m-th order X-valued elliptic operators and investigate the boundedness properties of integral operators with Poisson kernels, associated with some boundary operators under which the complementary conditions hold. These results play a key role in the investigation of the solvability of Boundary Value Problems (BVPs).

Keywords: X-valued elliptic equations, UMD property, Noetherness, X-valued Sobolev spaces, Schauder-type estimates, Poisson integrals.

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CERN Today: Pushing the Boundaries of Particle Physics

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CERN, the world's largest particle physics laboratory, continues to lead the exploration of fundamental questions about the universe. From high-energy collisions at the Large Hadron Collider (LHC) to the development of next-generation detectors and computing systems, CERN's current research pushes the limits of both technology and theory. This talk will provide an overview of recent developments at the CMS[1] experiment at CERN, including the latest results from LHC Run 3, major detector upgrade efforts such as the High-Granularity Calorimeter (HGCAL), and ongoing searches for new physics beyond the Standard Model.[2] Special emphasis will be placed on the role of international collaboration, technological innovation, and precision measurements in shaping the future of particle physics.

Keywords: Particle physics, CERN, CMS experiment.

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INVITED SPEAKERS ABSTRACTS

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TURAN-FUNDAMENTAL SCIENCES SYMPOSIUM
TURAN-TEMEL BİLİMLER SEMPOZYUMU
Honorary Chair/Onursal Başkan: Prof. Dr. Aziz SANCAR

Maveraünnehir, Horasan, Harezm Havzasında Muhtelif İlimlerin Birlikte Gelişmesi, Meşhur Alimlerin Yetişmesi, Kıymetli Eserlerin Yazılması Üzerine Bir Analiz

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Turan coğrafyasının en önemli ilim, kültür havzası Maveraünnehir, Horasan ve Harezm topraklarıdır. Türklerin İslamiyeti kabul etmesinden sonra Müslüman Türk Devletlerinde birçok farklı ilim eş zamanlı olarak gelişmiştir. Özellikle 7-11 yüzyıllarda klasik ilimler, tıp, matematik, fizik, kimya, biyoloji, astronomi alanlarında yetişen Biruni, Harezmi, Fergani, Cürcani, Razi, İbn-i Sina, Hazini, Cabir b. Hayyan, Sabit b.Kurra, Ömer Hayyam, Nasreddin Tusi, Cezeri, Uluğ Bey gibi alimler büyük ilmi keşifler, icadlar yapmışlar, eserleriyle bilim tarihinde yer almışlardır. Aynı dönemlerde tefsir, hadis, fıkıh, kelam, tasavvuf gibi dini ilimlerde İmam Buhari, İmam Tirmizi, İmam Maturidi, Zemahşeri, Nesefi, Mergilani, Serahsi, Ahmed Yesevi, Necmeddin Kübra, Yusuf Hemedani, Bahaeddin Nakşibend gibi alimler eserleriyle, talebeleriyle bir okul ve ekol olmuşlardır. Yine Felsefe, mantık, edebiyat, musiki alanlarında İbn-i Sina, Farabi, Ali Şir Nevayi gibi büyük alimler insanlığı aydınlatmışlardır.

İlmi çalışmalara karşı Türklerin öğrenme, araştırma çabaları ve istekleri, şevk ve motivasyonları müslüman olduktan sonra tezahür etmiştir. Devletlerin başında bulunan Emir, Sultan, Han ve Beğlerden halka doğru toplumun görülen ilim sevgisinin ve gayretinin kaynağı şüphesiz, ilme ehemmiyet veren, insanlığa faydalı olmayı teşvik eden Kuran ve Hadislerdir. Maveraünnehir, Horasan ve Harezm havzasında ilimlerin tekamülü, terakkisi, inkişafı, intişarında çeşitli saikler vardır. Bu topraklara İslam ilk elden seyyidler, sahabe ve tabiin nesliyle gelmiş, yerel halk dini aslından, kaynağından, özünden almıştır. Toplumun imarı ve nizamında Türk tasavvuf tarihinin öncü sufileri belirleyici olmuş, insanlığa faydalı olmak gayesini, ilmin gereğini hayatın önceliği olarak insanlara sunmuşlardır. Klasik ilimlerle uğraşan alimlerin dini bilgilere, dini ilimlerle meşgul olanların klasik ilimlere vukufiyeti her iki sahada tebarüz etmiştir. Mesela, filozof hekimler, matematikçi fakihler, fizikçi ilahiyatçılar dikkat çekmektedir. Nizamiye Medreseleri, Memun Akademisi, Beytü'l Hikme gibi merkezler ilmi faaliyetlerin gelişmesine ve alimler arasında irtibatların artmasına vesile olmuştur.

Savaşlardan sonra fethedilen yerlerin ileri gelen alim ve sanatkarları belirli şehirlere ve başkentlere aktarılmış, saraylarda itibar görmüş ve medreselerde yer almışlardır.

Bölgede hakimiyet tesis eden Karahanlılar, Gazneliler, Selçuklular, Harzemşahlar, Samaniler, moğol istilasından sonraki yüzyıllarda Timuriler, Şeybaniler ilmi çalışmaları teşvik etmişler, alimlere önem vermişler, sahip çıkmışlar, destek olmuşlardır. Birçok Emir, Sultan, Han ve Beğ iyi eğitimli, ilmi birikime sahip şahsiyetlerdir. Saraylar alimlerin buluşma mekanı haline gelmiştir. Devletlerin ekonomik güçlerine göre medreselerin, kütüphanelerin yapılmasına, eserlerin yazılmasına, alimlerin maişetine kaynak ayırılmasına önem verilmiştir. Göçebe hayatı yaşayan Türklerin şehirleşmesiyle halkın ilme ve alimlere desteklerini başlamış, alimlerin itibarını yükselmiştir. Ünlü seyyahlar İbni Batuta ve İbni Fadlan seyahatnamelerinde halkın ilme iştiyakına işaret etmektedirler. Farklı kültürlere, dillere, ırklara, dinlere mensup insanların birlikte yaşadığı Semerkant, Buhara, Gürgenç, Hive, Belh, Merv gibi şehirler ilmi çalışmaların ve alimlerin merkezi haline gelmiştir. Vakıf müessesenin gelişmesiyle ilim yolcularına, alimlere, medreselere, eserlere zenginler ve eşraf hamilik yapmıştır. Coğrafyanın özelliğinden, zirai, ticari ve içtimai ihtiyaçlar ve sebeplerden dolayı matematik, astronomi ilimleri gelişmiştir. Türklerin seyahat emniyetini sağladığı zamanlarda İpek Yolu ve Hint Baharat Yolu ilim, irfan, sanat yolu haline gelmiş, alimler güven içinde ilim ve kültür merkezlerine yolculuklar yapmışlar, eserlerin intikali, alimlerin münasebetleri kolaylaşmıştır. Bu havzada Mezopotamya, Mısır, Hind, İran, Roma, Eski Yunan, Çin ve Endülüs medeniyet birikimlerinden faydalanılmış, ilim ve kültür merkezleriyle bilgi akışı sürmüştür.

Bu çalışmada ilim havzası Maveraünnehir, Horasan ve Harezm'de klasik, dini ve içtimai ilimlerin gelişmesi, büyük alimlerin yetişmesi ve kıymetli eserlerin aynı zamanlarda yazılmasının saikleri ve sebepleri değerlendirilerek bir analiz yapılmaya çalışılacaktır.

Anahtar Kelimeler: İlim, alim, Turan, Maveraünnehir, Horasan, Harezm.

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A Decade of Machine Learning Research: Evaluation Metrics, Taxonomies and Bibliometrics Analysis

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Machine learning (ML) has revolutionised many scientific and industrial domains in the last ten years, spurring automation and innovation. However, thorough evaluation is necessary to ensure the efficacy and dependability of ML models, so it is crucial to comprehend important metrics and methodologies. With an emphasis on bibliometric analysis, taxonomies, and evaluation metrics, this presentation explores the trends in machine learning research over the last ten years. We classify machine learning algorithms according to their approaches and examine key evaluation metrics that have influenced model evaluation in different fields. Furthermore, within the ML community, bibliometric analysis identifies key research trends, significant publications, and networks of collaboration. In addition to growing ethical concerns and the need for standardised benchmarking, our findings show changes in evaluation methodologies, the continued dominance of deep learning, and the growing emphasis on explainability and fairness.

Keywords: Machine learning, artificial intelligence.

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YTÜ FEN EDEBİYAT FAKÜLTESİ YTÜ FACULTY of ARTS and SCIENCES
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On the L_1 Data Dirichlet Problem for the Nonuniform Parabolic Equations of Second Order

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For the nonuniform parabolic equation of second order the first boundary value is considered. The data on the right hand side of the equation

$$\partial_t u - Lu = f;\ \ Q_T = [0,T) \times D$$

$$u(0,z) = g(z),\ \ z \in D$$

and the initial value functions f, g are of the L_1 class. The sufficient conditions are proposed to the degeneration in the spartial part of the equation in terms of the ball conditions on R^n. For the purpose are proved new inequalities of the Poincare-Sobolev type having nonuniform degenerate gradient. For the subject we refer to the works[1,2].

Keywords: Non-uniform parabolic equation, Sobolev-Poincare inequality, existence and uniqeness.

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ABSTRACTS OF ACCEPTED ORAL PRESENTATIONS

PRESENTED AT THE SYMPOSIUM

MATHEMATICS

YTÜ FEN EDEBİYAT FAKÜLTESİ YTÜ FACULTY of ARTS and SCIENCES
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2-Parameter Generalized Quaternions with Generalized Tribonacci Numbers Components

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In this presentation, our main goal is to introduce the combination of generalized quaternions and generalized Tribonacci numbers which are quite a big special recurrence family for third-order special recurrence numbers. We define the non-negative and negative subscripted generalized quaternions with generalized Tribonacci numbers components. Then, we give some special cases and achieve some properties with respect to these type new quaternions such as; Binet formulas, generating functions, exponential generating functions, Poisson generating functions, summation formulas, matrix formulas, and special determinant properties.

Keywords: Generalized Tribonacci numbers, generalized quaternions, generalized quaternions with generalized Tribonacci numbers components.

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Calculus on Real-variable Split Quaternion-valued Functions

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In this study, we investigate fundamental analytical concepts within the framework of split quaternions, focusing specifically on real-variable split quaternion-valued functions. Although the literature includes various studies on split quaternion-variable functions, the definitions and explanations of limit, continuity, and certain derivative concepts remain either sufficiently undeveloped or ambiguous. Addressing this gap, we define the concepts of limit, derivative, P-limit, P-derivative, and integral for split quaternion-valued functions of a real variable, and give several theorems with proofs, including a theorem that determines the conditions under which the classical limit and the P-limit coincide. Additionally, numerous examples are provided to explain the concepts of P-limit, P-derivative and integral of elementary functions in particular.

Keywords: Split Quaternions, real-variable split quaternion-valued functions, limit, derivative, integral.

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Characteristic Roots, Eigenvalues and Eigenvectors of a Certain Type of 4×4 Dual Tridiagonal Matrices

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Dual number matrices serve as effective tools in modeling problems in brain science and multi-agent formation control. In the literature one can find determinants, characteristic polynomials, eigenvalues, and eigenvectors of dual number matrices. An $n \times n$ dual number matrix may have exactly n eigenvalues, none, or infinitely many. In this presentation, by taking a certain type of 4×4 dual number tridiagonal matrix, we demonstrate that it has exactly four eigenvalues, which directly result from structured combinations of the eigenvalues of its real matrix components. Finally, we present illustrative examples that support and clarify our theoretical findings.

Keywords: Dual numbers, characteristic polynomial, eigenvalues, tridiagonal matrix.

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Comparative Analysis of Türkiye's Road Traffic Accidents Using Data Mining Techniques

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Traffic accidents, especially involving unprotected vehicles such as motorcycles and mopeds, are significant public safety concern due to their high fatality and injury rates. In this study, motorcycle accidents in Türkiye were analyzed by applying classification techniques in the field of data mining. Three algorithms, namely Logistic Regression, Naive Bayes and Random Forest, were applied to the data on fatal and injury traffic accidents provided by the Traffic Department of the General Directorate of Security. The performance of the studied models was evaluated using multiple evaluation criteria in order to determine the most accurate method for predicting accident outcomes. The analysis showed that the Random Forest algorithm achieved the highest classification accuracy for both fatal and non-fatal accidents. In addition, the main risk factors affecting the occurrence of accidents, including driver errors, accident time and environmental conditions, were identified. These results provide helpful information for decision makers who want to improve motorcycle safety and create focused prevention strategies.

Keywords: Data mining, traffic accidents, motorcycle accidents, Python.

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The Moment of Inertia of Generated Curves: A Holditch-Type Theorem

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Holditch's Theorem states that when a fixed-length segment rotates inside a convex closed curve, a point on the segment traces a closed curve whose enclosed area is smaller than that of the original curve by πpq. In our previous work, the moment of inertia of parallel curves was examined in this context.

In this study, we focus on generated curves, which are constructed from a base curve using specific geometric rules but are not equidistant from it. We calculate the moment of inertia of these curves. Based on the results obtained, we present a Holditch-type theorem involving the moment of inertia. The aim is to explore the relationship between generated curves and their inertial properties, offering a new interpretation parallel to classical geometric results.

Keywords: Holditch's theorem, Holditch surface, generated curves, moment of inertia.

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Do Oil Prices Have a Chaotic Effect on Unemployment and Inflation

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Oil prices have a significant impact on macroeconomic variables on a global scale. Although unemployment and inflation rates, in particular, are sensitive to fluctuations in oil prices, the nature of this relationship can be non-linear and chaotic. Research exploring the chaotic nature of this relationship remains limited. In linear time series analyses, chaotic behaviors are often treated as stochastic, and unexplained observations are dismissed as random anomalies. However, while some papers examined oil prices through the pass-through mechanism, research on their chaotic structure remains limited, with notable contributions from Adrangi et al.(2001), Komijani et al(2011). In this article, the effects of oil prices on unemployment and inflation will be examined within the framework of a chaotic dynamic structure. Within the scope of the analysis, the rescaled range (R/S) of Lo and the Mandelbrot-Wallis methods will determine fractionality and long-term dependence. Renyi, Shannon, Tsallis and HCT entropy tests will be used to determine entropy. The Kolmogorov-Sinai complexity (KSCM) method will identify evidence of the complexity of variables. The Hurst exponents will be used to investigate evidence of mean reversal, chaos, and the Brownian movement. The Lyapunov exponent (LE) will discover evidence of chaos. The aim is to reveal how changes in oil prices can create disorder or chaos in unemployment and inflation dynamics, using the most up-to-date and advanced tools of time series analysis.

Keywords: Oil prices, chaos theory, unemployment, inflation, entropy.

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Genel DSW Sistemine Genişletilmiş Jacobi Eliptik Fonksiyon Yaklaşımı: Tam Çözümler, Kararlılık ve Simülasyonlar

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Bu çalışmada, su dalgalarının bir modeli olarak kabul edilen genel Drinfel'd–Sokolov–Wilson (DSW) sisteminin ilerleyen dalga çözümleri ve dalga dinamiği araştırıldı. DSW sistemi, dalga dönüşümüyle daha basit bir adi diferansiyel denklem sistemine dönüştürüldü. Ardından genişletilmiş Jacobi eliptik fonksiyon açılım yöntemi ve eliptik rasyonel fonksiyon açılım yöntemi uygulanarak tam çözümler elde edildi. Çözümlerin davranışları, farklı parametreler altında Maple™ programı ile yapılan iki ve üç boyutlu sayısal simülasyonlarla analiz edildi. Jacobi eliptik fonksiyonlar, fizik ve mühendislikte geniş uygulamalara sahip olup su dalgaları, gelgitler ve akustik dalgaların modellenmesinde kullanılmaktadır. Son olarak elde edilen çözümlerin yeteneğini ortaya koymak amacıyla kararlılık özelliği uygulanarak çözümler test edildi.

Anahtar Kelimeler: Drinfel'd-Sokolov-Wilson (DSW) sistemi, Jacobi eliptik fonksiyon, tam çözüm.

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Bazı Antiviral Moleküllerin Topolojik Karakterizasyonu

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Bu çalışmada, seçilen bazı antiviral bileşiklerin[1], yapısal özellikleri, graf teori temelli yaklaşımlarla analiz edilmiştir. Her bir molekül, atomların köşelere ve bağların kenarlara karşılık geldiği moleküler bir graf olarak modellenmiştir. Çalışmada ayrıca, temel moleküler grafların yanı sıra, kenar-komşuluk grafları gibi türetilmiş yapılar da incelenmiştir. Moleküler graflar için, graf teoride sıkça kullanılan temel topolojik indeksler[2–3] ile Platt sayısı[4] hesaplanmış ve aralarındaki ilişkiler karşılaştırmalı olarak araştırılmıştır. Ayrıca, bu indeksler ile moleküllerin belirli fizikokimyasal özellikleri arasındaki bağlantılar korelasyon analizleriyle ortaya konmuştur.

Elde edilen bulgular, istatistiksel ve görsel analizlerle desteklenmiş olup, topolojik indeksler arasında yapısal benzerliklerin ve farklılıkların bulunduğunu göstermektedir. Bu karşılaştırmalı analiz; moleküler yapıların sayısal temsiline ilişkin anlayışı derinleştirmekte ve graf teori kuramına dayalı bu yaklaşımın yapısal sınıflandırma ile öngörüsel modelleme alanlarındaki potansiyelini vurgulamaktadır.

Anahtar Kelimeler: Antiviral bileşikler, topolojik indeksler, platt sayısı, kenar-komşuluk grafı.

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Affine Factorable Surfaces in Euclidean 4-Space E^4

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In this study the affine factorable surfaces in Euclidean 4-space were defined. We have obtained the Gaussian, normal and mean curvature of the affine factorable surfaces in E^4. Further, the classification of surfaces with flat, normal flat and minimal affine factorable surfaces was given.

Keywords: Affine factorable surfaces, Gaussian curvature, mean curvature.

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Monge Surfaces with Their Applications

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Analytical surfaces have an important place in differential geometry. These surfaces are frequently used in geometric design. The ability to describe such surfaces with parametric equations is very common for modeling with "computer-aided geometric design". In this study, a characterization of Monge surfaces, which is an important type of analytical surfaces, is discussed. Monge surfaces are surfaces that are examples of carved surfaces. These surfaces are quite impressive in terms of aesthetics in architectural design and exterior cladding of buildings.

Keywords: Monge surface, carved surface.

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Bazı Özel Afin Yapıların ve Duallerinin Kromatik İndislerinin Bulunması Üzerine

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Bu çalışmada, klasik graf teorisinin temel kavramlarından olan köşe ve kenar renklendirme ilkeleri afin yapılara uyarlanmış; bu doğrultuda yeni renklendirme algoritmaları geliştirilmiş ve en uygun renklendirme sayıları mertebe derecelerine bağlı olarak belirlenmiştir. Bazı özel afin yapılardaki nokta ve doğruların renklendirilmesine yönelik çeşitli genel sonuçlar ve teoremler elde edilmiştir. Araştırma kapsamında, geometrik yapılar graf teorisinin köşe ve kenar renklendirme yaklaşımları çerçevesinde ele alınarak, bu iki alan arasındaki yapısal ilişkiler derinlemesine incelenmiştir. Özellikle köşe ve kenar renklendirme prensiplerinin afin yapılara genişletilmesi, kombinatoryal matematik ile geometri arasındaki etkileşime yeni bir bakış açısı kazandırmakta ve mevcut renklendirme tekniklerine katkı sağlayacak nitelikte özgün sonuçlar sunmaktadır.

Anahtar Kelimeler: Afin düzlem, kromatik indis.

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Optical Bullets for the (3+1)-Dimensional Perturbed Nonlinear Schrödinger Equation having the Cubic-Quintic Laws and the Spatio-Temporal Dispersion

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This study includes the soliton dynamics governed by the (3+1)- dimensional perturbed nonlinear Schrödinger equation having the cubic-quintic laws and the spatio-temporal dispersion. This extended form of the nonlinear Schrödinger equation is particularly significant for modeling the propagation of ultrashort optical pulses in nonlinear media, where conventional dispersion plays a minimal role, but higher-order and nonlinear effects become dominant. To obtain optical bullets, we employ the addendum to the Kudryashov's method. By applying suitable constraints on model parameters, we establish the conditions necessary for the existence of various optical bullets. In addition, a comprehensive analysis of modulation instability is conducted to further elucidate the stability characteristics of the model. The results provide valuable theoretical insights into the complex behavior of pulse propagation in advanced photonic structures, with implications for the design and optimization of nonlinear optical waveguides and fiber communication systems.

Keywords: The Schrödinger model, optical bullets, cubic-quintic laws, modulation instability analysis.

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TBMM Maarif Vekâletinin 1920 Yılında Aldığı Geometri Öğretimi Kararları Üzerine

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Bu çalışmada TBMM Maarif Vekâleti Hicri 1339 (Miladi 1920) yılında ilkokullarda geometri öğretiminin nasıl olması gerektiğine dair aldığı kararlar[1] ve bu karar metninin daha önce yayınlanmış benzerleri[2] üzerinde durulacaktır. Aradan 100 yıldan daha fazla bir zaman geçmesine rağmen, geometri öğretiminde günümüzde uygulanması arzulanan yöntemlerin Payitaht Istanbul'un işgal altında olduğu, ülkenin her yerinde savaşının hüküm sürdüğü bir dönemde alınan bu kararlarla uygulamaya konulması eğitime verilen önemin göstergesidir.

Anahtar Kelimeler: Geometri öğretimi, matematik tarihi, Osmanlı Devleti'nde eğitim.

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Competitive Systems via Hamiltonian Framework and Artificial Neural Estimation

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In this study, the dynamical behavior of competitive Lotka-Volterra systems has been investigated by analyzing the curvature properties of their integral curves in a Hamiltonian framework[1]. In the literature[2-3], the three and four species systems have been explored in terms of their geometric properties, especially those reflecting ecological interactions. In recent advances in the analysis of large-scale Lotka-Volterra systems and species persistence, artificial neural networks (ANNs) have been applied to approximate and reconstruct integral curves and curvature properties from partial or noisy observations[4]. Furthermore, Hamiltonian conservation laws have been integrated with data-driven learning techniques to create a unified framework, thus providing a comprehensive representation of both structural and empirical aspects of nonlinear population dynamics[5]. By integrating mathematical theory with machine learning, this study contributes both structural and computational perspective on the behavior of nonlinear systems modeled by Lotka-Volterra equations.

Keywords: Curvatures, competitive systems, Hamiltonian frames, artificial neural networks.

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Data-Driven Estimation of Krylov Iterations in Riccati Solvers

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This study proposes a machine learning approach to estimate the iteration count needed by Krylov subspace methods in solving differential Riccati equations (DREs). Krylov methods, particularly those using the Arnoldi process, are efficient for large-scale control problems[1-2]. However, stopping criteria based on fixed tolerances may not suit all systems.

We construct a dataset by tracking system features and residual norms during the Arnoldi process[3], then train regression models to predict the necessary iteration count[4]. Results show that these models improve convergence estimation and computational efficiency, supporting the integration of data-driven techniques into classical solvers[5].

Keywords: Riccati equation, Krylov methods, Arnoldi iteration, machine learning, regression, iteration prediction.

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q-Türev Kullanılarak Tanımlanan Yeni Bir Harmonik Fonksiyon Sınıfının Geometrik Özellikleri

Serkan ÇAKMAK

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Bu çalışma, q-türev operatörleriyle tanımlanan yeni bir harmonik fonksiyon sınıfının geometrik özelliklerini incelemektedir. Ele alınan sınıfın katsayı sınırları, distorsiyon teoremleri, konvekslik ve yıldızılık yarıçapları belirlenmiş; ayrıca konveks kombinasyon ve konvolüsyon altında kapalılık özellikleri analiz edilmiştir. Elde edilen sonuçlar, q-analogu harmonik fonksiyonların yapısını daha iyi anlamaya katkı sağlamaktadır.

Anahtar Kelimeler: Harmonik fonksiyonlar, q-türev, geometrik fonksiyon teorisi, konvekslik, yıldızsılık.

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Some Characterizations of Gradient Ricci-Yamabe Solitons

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In this study, we investigate doubly warped product manifolds admitting gradient Ricci-Yamabe solitons. We find the main relations for a doubly warped product manifold to be a gradient Ricci-Yamabe soliton and demonstrate this result for a physical model of the universe, namely, for the doubly warped spacetime.

Keywords: Gradient Ricci-Yamabe soliton, doubly warped product, spacetime.

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Matematik Lisans Öğrencilerinin Seçmeli Ders Seçimlerinin Oyun Teorisi ile Matematiksel Modellenmesi

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Bu çalışmada, matematik lisans öğrencilerinin seçmeli ders tercihlerinde etkili olan faktörler oyun teorisi çerçevesinde modellenmiştir. Öğrencilerden anket yoluyla toplanan verilerle, en çok tercih edilen iki ders "oyuncu" olarak belirlenmiş ve öğrencilerin karar kriterleri "strateji" olacak biçimde sınıflandırılmıştır. Analiz sürecinde hem sıfır toplamlı hem de sıfır toplamlı olmayan oyun modelleri kullanılmış; oyun modellerine stratejik baskınlık, minimax yöntemi ve Nash dengesi gibi çözüm yöntemleri uygulanmıştır. Elde edilen sonuçlar, öğrencilerin ders seçimlerinde bireysel ve sosyal etkenlerin rol oynadığını göstermektedir. Bu modelleme ile müfredat planlamalarında öğrenci davranışlarını stratejik bakış açısıyla değerlendirerek daha verimli ders programları oluşturulmasına katkı sunmayı amaçlamaktadır.

Anahtar Kelimeler: Oyun teorisi, seçmeli ders, Nash dengesi, sıfır toplamlı oyun, sıfır toplamlı olmayan oyun, stratejik karar.

Teşekkür Bölümü: Bu çalışma 2210-A Yurt İçi Genel Yüksek Lisans Burs Programı kapsamında TÜBİTAK Bilim İnsanı Destek Programları Başkanlığı tarafından desteklenmektedir.

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Improved Fixed Point Approximations via Picard's Three-Step Iteration for Suzuki-Type Non-Expansive Mappings

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In this study, we investigate the weak and strong convergence behavior of Picard's three-step iteration scheme applied to Suzuki generalized non-expansive mappings in the context of uniformly convex Banach spaces. By employing essential tools such as the Opial condition, the demiclosedness principle, and asymptotic center theory, we establish several convergence theorems. Our results demonstrate that under appropriate assumptions, the iterative sequence converges strongly and weakly to fixed points of enriched Suzuki-type non-expansive operators. The proposed iteration method enhances the approximation process in comparison to classical schemes, offering improved convergence performance. This work contributes to the ongoing development of fixed point theory and provides a more flexible and efficient framework for solving nonlinear problems in Banach spaces.

Keywords: Fixed point, Suzuki generalized non-expansive mapping, three-step Picard iteration, strong convergence, weak convergence.

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Investigation of Fractal Dimension Algorithms in Different Geometries

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Fractal geometry is a sub-branch of mathematics used to mathematically describe the complex and irregular structures observed in nature. The concept of fractal dimension, also referred to as a complexity measure, is employed to quantify these intricate structures. This measure, which goes beyond classical Euclidean geometry, reveals the degree of complexity underlying phenomena such as biological signals, natural patterns, financial time series, and neurological data. Owing to its non-integer, fractional nature, the fractal dimension provides a powerful tool for characterizing the geometry of nature. Numerous algorithms have been developed to calculate fractal dimensions. In particular, the Katz and Higuchi algorithms stand out for their high precision in analyzing time series data. The Katz algorithm defines complexity as the ratio between the total length of a signal and its maximum deviation, whereas the Higuchi algorithm estimates dimensionality using a log-log regression across multiple subsequences. Both of these algorithms are widely used in the analysis of biological data, especially electroencephalographic (EEG) signals.

This paper aims to investigate these two fractal dimension algorithms within the framework of Galilean and Lorentzian (Minkowski) space-time geometries, in order to explore the physical interpretation of dimensional complexity. By embedding fractal analysis within these distinct geometric models, the study seeks to offer a novel perspective on how space-time assumptions can influence the calculation and interpretation of fractal dimensions.

Keywords: Fractal, Katz fractal dimension, Higuchi fractal dimension, Minkowski plane, Galilean plane.

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Machine Learning-Based Classification of Chaotic Behavior in Discrete Dynamical Systems

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Discrete dynamical systems that exhibit chaotic behavior form the foundation of many natural and engineering systems due to their sensitivity to initial conditions and unpredictability. This study aims to classify the parameter-dependent dynamical behaviors of one-dimensional discrete chaotic systems using machine learning methods. The study focuses on distinguishing chaotic and non-chaotic regimes of various discrete dynamical system models through the application of machine learning algorithms.

Keywords: Discrete dynamical systems, chaotic behavior, machine learning, classification.

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Variation of Parameters and Hölder Stability of Differential Systems with Initial Time Difference

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In this paper, we have investigated the relation between an unperturbed differential equations and a perturbed differential system that have different initial positions and an initial time difference by using the variation-of-parameter techniques employed to obtain integral formulae. To establish Hölder stability with initial time difference for nonlinear differential systems, the variational system associated with the unperturbed differential system must be used.

Keywords: Differential equations, initial time difference, Hölder stability, variation of parameters.

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W5-Curvature Tensor on a Complex Contact Space Form

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This article aims to examine the curvature properties of the W5-curvature tensor on a complex contact space form. We examine a complex contact space form under the W5-curvature tensor's W5-flat, ξ-W5-flat, GH-W5-flat, GH-W5-semi-symmetric, W5Q and W5(ξ, K)S conditions. We also demonstrate that there is no a complex contact space form for W5-flat, ξ-W5-flat, GH-W5-flat, GH-W5-semi-symmetric, W5Q and W5(ξ, K)S.

Keywords: Complex contact manifold, GH-sectional curvature, complex contact space form, W5-curvature.

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Schauder Estimates for Elliptic Operators in Banach-Sobolev Spaces

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In this work, we establish a Schauder-type estimate up to the boundary for elliptic operators with continuous coefficients on a finite-dimensional bounded domain, within a non-separable Banach-Sobolev space generated by a rearrangement-invariant Banach function space. This paper extends the results[1-3]. Our approach uses an abstract functional-analytic framework—combining interior estimates, extendibility properties of functions, and the theory of elliptic operators—instead of classical function-theoretic methods.

Keywords: Banach function space, rearrangement-invariant space, Banach-Sobolev space, elliptic operator, Schauder-type estimate.

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Identities on the Generalized Harmonic Numbers of Rank with Order Using Generating Functions

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In this study, we investigate new identities involving the generalized harmonic numbers of rank r with order $m = (m_0, m_1, \dots, m_r) \in (Z^+)^{r+1}$. By employing generating function techniques, we derive several summation formulas, recurrence relations, and connections with classical special numbers such as Stirling numbers and r-derangement numbers. Our approach generalizes existing results and provides a unified framework that links classical special numbers with harmonic numbers and generalizations. These findings contribute to the combinatorial and analytical understanding of generalized harmonic numbers and their applications in number theory.

Keywords: Generalized harmonic numbers, generating functions, combinatorial identities.

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Solitary Wave Solutions of the Two-Dimensional Fractional-Order Nonlinear Schrödinger Equation

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In this study, solitary wave solutions of the two-dimensional fractional-order nonlinear Schrödinger (2DfNLS) equation are investigated using the Petviashvili method. Both single and double soliton profiles are constructed by numerically solving the 2DfNLS equation, which takes the following form:

$$iu_t - \beta(-\nabla)^s u - V(\mathbf{x})u - \gamma|u|^{2\sigma}u = 0, \ \ \mathbf{x} = (x, y), \ t > 0.$$

Here, $u = u(x, y, t)$ denotes the wave function, $\nabla = \partial_{xx} + \partial_{yy}$ is the two dimensional Laplacian operator, and $V(\mathbf{x})$ represents the potential function. In this equation, the nonlinearity is characterized by $\sigma > 0$, with $\sigma = 1$ corresponding to the cubic case. The fractional operator $(-\nabla)^s$, where $0 < s < 1$, introduces nonlocal effects into the model and generalizes the classical nonlinear Schrödinger equation (recovered when $s = 1$), a well-known model for the propagation of weakly nonlinear waves in dispersive media. The equation may describe either a focusing or defocusing regime, depending on the signs of the parameters β and γ.

The aim of this study is to provide a comprehensive analysis of soliton solutions for the 2DfNLS equation. The Petviashvili method, employed in this work, emerges as an effective numerical scheme for computing nonlinear stationary solitons, particularly useful for analyzing stable localized structures. The method was originally introduced for solitary wave solutions of nonlinear wave equations in plasma physics[1], and its convergence properties and optimal parameter conditions were studied in detail[2]. The findings offer valuable insights into the dynamics of soliton-like wave phenomena in various physical systems.

Keywords: Fractional Schrödinger equation, soliton dynamics, Petviashvili method.

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Boundedness Criteria for the G-fractional Integral and G-fractional Maximal Operator on Gegenbauner-morrey Spaces

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In my report we evtablish necassary and sufficient conditions for the boundedness of the Gegenbauner fructional (G-fructional) integral on Gegenbauner-Morrey (G-Morrey) spaces associated with the Gegenbauner differential operator. A similar problem is studied for the G-maximal function. In the paper, we prove a Adams type theorem on the boundedness of the Gegenbauer fractional integral J_G^{α} and maximal function generated by Gegenbauer differential operator

$$G \equiv G_{\lambda} \equiv (x^2-1)^{\frac{1}{2}-\lambda}\frac{d}{dx}(x^2-1)^{\lambda+\frac{1}{2}}\frac{d}{dx}, \qquad x\,\epsilon(1,\infty), \quad \lambda\epsilon\left(0,\frac{1}{2}\right),$$

introduced in[2]. The result obtained in an analog of the corresponding theorem obtained for Riesz potentials in[1].

Keywords: G-fructional integral, G-maximal operator, G-Morrey spaces.

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Hemen Hemen Neo Kobalans Sayıları

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Bu çalışmada hemen hemen neo kobalans sayıları tanımlanmış ve bu sayıların genel terimleri, balans sayılarına bağlı olarak elde edilmiştir. Daha sonra bu sayıların Pell, Pell-Lucas, üçgensel ve kare üçgensel sayılar ile olan ilişkisi ortaya çıkartılmıştır. Son olarak bu sayıların ilk n-terim toplamları elde edilmiştir.
Keywords: Balans sayıları, hemen hemen balans sayıları, Pell sayıları, üçgensel sayılar.

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Δ-Convergence For Proximal Point Algorithm And Fixed Point Problem in Generalized $CAT(0)$ Space

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This paper investigates generalized $CAT(0)$ spaces by introducing their definition and examining key structural properties. A generalized CN^* inequality is formulated within this framework, and it is subsequently employed to demonstrate the strong convergence and Δ −convergence of the Karakaya-iteration process towards fixed points of nonexpansive mappings. Building upon, the Karakaya -iteration method is further applied to address a minimization problem, with particular emphasis. Two numerical examples are presented: the first within a $CATp(0)$ space that does not satisfy the $CAT(0)$ condition, and the second within a $CAT(0)$ space that is not a Hilbert space.

Keywords: $CAT(0)$ spaces, proximal point algorithm , Δ −convergence.

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Impulse-Hydrodynamic Model of Explosive Impact on a Half-Plane with Circular Cavity

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This study considers the explosion of a surface cord charge with variable cross-section in a half-plane containing a circular cavity. The impulse hydrodynamic model [1,2] is used, where the medium is treated as an ideal incompressible fluid. The main objective is to determine the width of the ejection cavity, where the particle velocity at the edge reaches the critical value v_0.

The free surface is assumed to coincide with the x-axis, and the thickness of the charge is defined by the function $y = f(x)$. The pressure is proportional to the charge thickness: $P = kf$, where k is a known constant. The potential along the x-axis is given by $\varphi = -kf(x)/\rho$, where ρ is the density of the medium. The complex potential is introduced as $w(z) = \varphi(x, y) + i\psi(x, y)$. The goal is to find the function $w(z)$ in the lower half-plane $Imz < 0$ with a circular cavity, satisfying the boundary conditions: $\varphi = -kf(x)/\rho$ for $x \in(-\infty\ ,\ \infty)$ and $\varphi = 0$ on the circle $z - ih = a_0 \exp(i\theta)$ $(0 \le \theta < 2\pi)$, a_0 is the radius of the cavity, and h is the depth of its center. By conformal mapping $z_1 = z_1(z)$, the domain is transformed into an annular region. The function $w(z_1)$, analytic in the ring, is represented as $w(z_1) = \tilde{A} lnz_1 + \widetilde{w}(z_1)$, where$\tilde{A}$ $=-\frac{1}{lnq}\frac{1}{2\pi}\int_0^{2\pi}\big(u_0(\gamma) - u_1(\gamma)\big)d\gamma$, $u_0(\gamma) = Rew\big(e^{i\gamma}\big), u_1(\gamma) = Re\, w\big(qe^{i\gamma}\big)$. The function $\widetilde{w}(z_1)$ is defined by the Villat formula [3]: $\widetilde{w}(z_1) = \frac{i\omega_1}{\pi^2}\big(\int_0^{2\pi} u_0(\gamma)\varsigma\left(\frac{\omega_1}{\pi i} lnz_1 - \frac{\omega_1}{\pi}\gamma\right)d\gamma - \int_0^{2\pi}(u_1(\gamma) - \tilde{A} lnq)\zeta_3(\frac{\omega_1}{\pi i} lnz_1 - \frac{\omega_1}{\pi}\gamma)d\gamma) + i\beta_0,$ where $\varsigma(z_1)$ and, $\varsigma_3(z_1)$ are the Weierstrass zeta functions, β_0 is an arbitrary real constant, and q = exp(−πω₃ / iω₁).

The resulting expression for the complex potential allows determining the geometry of the ejection cavity and the velocity distribution in the medium and on the cavity boundary. Numerical results are of practical importance.

Keywords: Explosion, pressure impulse, potential.

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Model and Theorem of Existence of the Problem of Optimal Control of the Customs Clearance Process

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The article examines the problem of modeling the multi-stage process of customs clearance of foreign trade goods. A mathematical model for controlling the considered process has been developed. The essence of customs risks is presented and the theorem on the existence of a solution to the problem of optimal control of the customs clearance process is proven.

The problem of optimal control of the customs clearance process is considered as a linear programming problem with variable coefficients of the objective function[1]. An analysis of scientific papers on the study of similar problems showed that a sufficient number of studies have been conducted and certain methods have been developed for solving the problem of linear programming with variable coefficients. For example, in the work (Pinsker A.G.) the problem of linear programming with variable coefficients was investigated by introducing the concept of resolving combinations of coefficients of the objective function[2]. Based on the results of this study, within the framework of the present research, the following theorem is proven:

Theorem. The task of optimal management of the customs clearance process with non-empty setset of plans and a targeted function of customs risks limited from above has a solution.

Keywords: Customs clearance, mathematical modeling, customs risks.

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Necessary Conditions for Weak and Strong Local Minimum the Problem of the Calculus of Variations with Higher Order Derivatives

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We consider the following problem of the calculus of variations with higher order derivatives in space $C^n([t_0;t_1])\ and\ PC^n([t_0;t_1])$

$$J(x)=\int_{t_0}^{t_1} L(t,x,\dot{x},\ddot{x},\dots,x^{(n)})dt\to min, \qquad (P)$$

$x^{(k)}(t_0)=x_{k0},\ x^{(k)}(t_1)=x_{k1},\ k=0,\dots,n-1.$

Theorem 1. Let $\hat{x}\in PC^n([t_0;t_1])$ provides a strong local minimum in the problem (P), with the integrant L being n times continuously differentiable in some neighborhood of the extended graph . Then, $\hat{x}$ satisfies the Euler– Poisson equation and the Weierstrass condition. Moreover, if the second derivative $L_{x^{(n)}x^{(n)}}$ exists, then the Legendre condition holds.

Theorem 2. Let $\hat{x}\in C^{2n}([t_0;t_1])$ provides a weak local minimum in the problem (P), with the integrant L being n+2 times continuously differentiable in some neighborhood of the extended graph. Then, $\hat{x}$ satisfies the Euler– Poisson equation and Legendre condition. If the strong Legendre condition holds then Jacobi conditions also holds.

Keywords: Calculus of variations, problem with higher order derivatives.

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Numerical Analysis of Stiffened Shell Structures Using an Efficient Three-Dimensional Finite Element

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Shell structures are one of the most distinctive engineering constructions in architectural design due to their efficiency in supporting loads through their curved geometries and providing a huge free surface without columns. These structures are commonly used in large-scale architectural structures such as sports stadiums and airports, where they provide a balance between technical aesthetics and practical functions[1]. Usually, they are subjected to important external loads with a huge covered surface. These cause large deflection of the structure and threaten its structural stability. To overcome these inconveniences, the shell can be reinforced with stiffeners to improve its structural stability. Unfortunately, with this type of complex structure in geometrical shape and boundary conditions, the analytical methods can not be used to check the stability, in addition to calculating the internal forces. Hence; numerical methods will be involved to solve the problem. In this paper, the numerical analysis is carried out with ABAQUS software, using a three-dimensional finite element "C3D8IH" for both the shell and the stiffener to overcome the incompatibility of degrees of freedom encountered when using two different elements[2]. The applications are carried out on stiffened shell structures, and the results obtained showed that the stiffeners significantly improve the stability of the structure and the efficiency of the element used is confirmed. This approach and the results obtained provide innovative design recommendations to improve the safety and rigidity of structures that cover huge surfaces.

Keywords: Numerical analysis, stiffened shell, three-dimensional element, complexe geometrical shape.

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Development of a General Algorithm for Solving Stability Problems of Plates on Elastic Bases

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The development of a general algorithm for solving stability problems of anisotropic plates is devoted[1]. The basics of the method of discretization of additional load are considered in the article[2]. The proposed discrete method for solving the problem of stability of elastic systems has a certain area of application, the main indicators of which follow from the fundamental characteristics of the method. These include, first of all, the necessary initial information. It is in this method is an additional load. To obtain it, it is necessary to have differential equations describing the deformation of the system in the given and adjacent states. Since such a condition almost does not meet any restrictions when setting the stability in the "small", the scope of application of the additive load method is very extensive. It includes not only simple elastic systems made of individual elements, but also complex systems formed by the articulation of elements. It is important to note that only differential equations are needed, not their solutions.

To determine the Green's function in complex cases, the variational-difference method is used. They solve a wide class of plane and spatial problems. In this case, the Green's function by its nature, as related to the unit load, is an invariant part of the calculation, it does not depend on the load of the system and is preserved at any given loads. Varying the grid of points in determining the Green's function, we have revealed a regularity, the use of which greatly facilitates computational operations. Thus, the proposed method of solving stability problems of elastic systems allows solving stability problems of plates on an elastic base of systems by the same general algorithm, has a wide enough area of application and significant advantage over existing methods.

Keywords: Stability, plates, elastic foundation, Green's function.

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Modelling Electromagnetic Wave Propagation Through Time-Varying Medium Using the Finite Difference Time Domain Method

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Electromagnetic wave propagation in time-varying medium using the Finite Difference Time Domain method is presented. Electromagnetic wave propagation in space varying medium like plasma slab was studied earlier. Sudden created plasma medium is chosen for the time varying medium. Permittivity of the medium is changing with time during the wave propagation. In order to compute the electric and magnetic field values we used the Maxwell Equation's. Finite Difference method used for the analysis of Maxwell Equation's. Maxwell Equation's in time domain are partial differential equations. Finite difference time domain method properly formulated and discretized the Maxwell Equation's in time and space to lead the solution step-by step.

Keywords: Time-varying medium, wave propagation, finite difference time domain method.

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Numerical Modeling of Stars and Mathematical Analysis

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In this study, which aims to demonstrate the relationship between stars and mathematics, the mathematical background of three formulas related to stars has been examined. The goal of this research is to show how consistent the values obtained from the examined formulas are with the GaiaDR3 data. The formulas investigated within the scope of the study are the Stefan-Boltzmann Law, the mass-luminosity relation, and the absolute magnitude equations. These theoretically examined relations were applied to both directly measured and model-derived values in the GaiaDR3 data set to evaluate their success. In this context, the mathematical derivations of the Stefan-Boltzmann Law and the absolute magnitude formulas were demonstrated, and the mass-luminosity relation was applied using regression to illustrate its connection with mathematics. The results obtained from the implementation carried out in the Python environment were visualized through diagrams and various graphs, providing a comprehensive understanding of the subject. As a result of the applications performed, it was observed that the values obtained from the three formulas generally show consistency with the GaiaDR3 dataset. However, some discrepancies were also noted in certain formulas, indicating areas for further investigation and refinement.

Keywords: Stefan-Boltzmann law, absolute magnitude, mass-luminosity relation, stars, numerical modeling.

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New Midpoint and Trapezoid-Type Inequalities for Co-ordinated m-Convex Functions via Variable-Order Fractional Calculus

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This paper presents novel midpoint and trapezoid-type inequalities for co-ordinated m-convex functions by employing variable-order Riemann–Liouville fractional integrals. Building on classical results for convex mappings, we extend these foundational inequalities to a more general class of m-convex functions defined on bidimensional rectangular domains, thereby providing tighter and more flexible bounds. The analysis utilizes the adaptability of variable-order fractional operators to achieve more refined results compared to constant-order fractional integrals. Specifically, the proposed inequalities generalize existing findings in the literature, encompassing both classical Riemann integrals and constant-order fractional integrals as special cases. We further demonstrate that the derived inequalities reduce to known results under appropriate parameter choices, highlighting their versatility. These contributions advance the theoretical landscape of fractional inequalities and are expected to have significant applications in numerical approximation, integral equations, and optimization methods, particularly in contexts where generalized convexity plays a crucial role.

Keywords: Variable-Order fractional integrals, co-ordinated convex mapping, midpoint-type inequalities, trapezoid-type inequalities, co-ordinated m-convex functions.

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A Study on Dual Quaternions with k-Pell and k-Pell-Lucas Coefficients

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Generalized forms of positive integer sequences for any positive integer k have been the subject of extensive research[1,2]. In 2013, Catarino defined k-Pell numbers. In this article, the Binet's formula, the generating function, some identities and properties of k-Pell numbers are examined[3]. In a different work, Catarino and Vasco conducted a study involving k-Pell numbers[4]. In 2013, definition of the k-Pell-Lucas sequence is given by Catarino and Vasco, and some properties, the generating function of k-Pell-Lucas numbers are provided[5]. In 2006, Majernik defined dual quaternions[6]. In 2011, Ercan and Yüce presented some properties of dual quaternions[7]. In 2016, Aydın and Yüce combined Pell numbers with dual quaternions[8]. Following a similar approach, we define new algebraic structures called k-Pell and k-Pell-Lucas dual quaternions. Subsequently, we examine their Binet formulas, generating functions, and various identities and properties associated with these sequences.

Keywords: k-Pell number, k-Pell-Lucas number, dual-quaternion.

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A Study on Vietoris' Hybrinomials

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Number sequences, which play a significant role in mathematics, are used to model and understand various situations across different scientific fields. In the literature, Fibonacci, Pell, Lucas, and Pell–Lucas are among the well-known and commonly studied number sequences. These sequences have been the subject of various studies focusing on their recurrence relations, Binet-like formulas, and algebraic properties. Vietoris numbers have also attracted attention in recent years and have been studied in several works. Number polynomials, developed in parallel with number sequences, provide a solid theoretical framework for generalizing and studying these sequences in greater depth. In this study, by combining hybrid numbers and Vietoris' polynomials, we introduce Vietoris' hybrinomials. Furthermore, we examine the recurrence relations, generating function, and Binet-like formulas.

Keywords: Vietoris' numbers, Vietoris' polynomials, hybrid number, hybrinomials.

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On Multiplicative Magnetic Flux Ruled Surfaces

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Multiplicative Lorentz forces and multiplicative magnetic striction curves acquired by the multiplicative geodesic Frenet frame on the multiplicative striction curve of the multiplicative ruled surface introduced by the multiplicative spherical curve in a multiplicative magnetic field are expressed, and multiplicative magnetic flux ruled surfaces (or non-Newtonian magnetic flux ruled surfaces) are constructed by multiplicative magnetic vector fields along multiplicative magnetic striction curves. The main idea of this paper is to acquire magnetic flux ruled surfaces and their basic properties by employing multiplicative calculus. Finally, some examples are provided to validate the results for multiplicative magnetic flux surfaces.

Keywords: Magnetic curves, non-Newtonian analysis, magnetic striction curve.

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A Study on the Dual Quaternionic Sequence with Vietoris' Components

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In this study, a dual quaternionic sequence is constructed using the rational Vietoris numbers as coefficients. This newly defined sequence serves as a commutative four-dimensional quaternionic generalization of the classical sequence. Fundamental properties such as the conjugate and norm are examined in detail. Furthermore, two-term and three-term recurrence relations, several important identities, a Binet-like formula, and the generating function are derived.

Keywords: Vietoris' sequence, recurrence relation, Binet's formula, generating function, dual quaternion.

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On an Algorithm for a Morphological Analyzer of the Azerbaijani Language

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This work presents the algorithmic analysis and mathematical modeling of the morphological structures of the Azerbaijani language. Our objective is to precisely model the application of affixes in Azerbaijani, a member of the agglutinative language family, using formal mathematical functions and rule-based systems. Morphological transformations applied to a word root K are represented as functions $f:K\rightarrow K\times S$, where S is the set of affixes constructed based on the language's phonetic regularities and morphological rules. Phonetic changes, such as the vowel harmony function $h:V\rightarrow V$ (operating over sets of vowels) and consonant alternation transformations $\sigma:C\rightarrow C'$ (between sets of consonants), are expressed within a formal mathematical framework[1].

The algorithm models morphological functions through mathematical logic and discrete structures to generate word roots combined with appropriate affixes. The resulting root-affix pairs are stored in a structured database, which is used for evaluating morphological analysis systems and supporting machine learning applications[2,3].

The proposed rule-based approach is significant for low-resource languages, including Azerbaijani, as an effective tool for the mathematical description and automated analysis of generative morphology. Furthermore, it opens new perspectives on morphological analysis of natural language based on discrete mathematical models[3,4].

Keywords: Mathematical modeling, discrete mathematics, Azerbaijani language, morphological analysis, rule-based system, natural language processin.

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The Influence of the Interaction with Fluids of the Hollow Cylinder with Inhomogeneous Initial Stresses on the ZGV Modes that Occur with Axisymmetric Wave Propagation

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In the authors' studies[1,2], it was found that in the case where the hollow cylinder has axisymmetric inhomogeneous initial stresses caused by the hydrostatic pressure on the outer surface of the cylinder, the axisymmetric waves may have the zero group velocity (ZGV) modes (or points). This means that there are such values of wave frequency and length at which the group velocity is zero under the non-zero wave number. The question of how the magnitude of the initial inhomogeneous stresses in the cylinder affects the frequency and velocity of the ZGV points was studied in[1] only for the case where the material of the cylinder is steel. In the present investigation, this study is developed for the case where the material of the cylinder is Lucite (Plexiglas) and the fluid is water. The investigations are carried out using the exact linearized 3D equations and relations of the theory of elastic waves in bodies with initial stresses and the linearized equations of the flow of barotropic non-viscous compressible fluids.

Keywords: Axisymmetric waves, ZGV modes, initial inhomogeneous stresses, inviscid fluid, immersed hollow cylinder, hydrostatic pressure, wave dispersion.

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On the Strong Solvability of a Nonlocal Boundary Value Problem for the Laplace Equation in Weighted Grand Sobolev Spaces in Rectangle

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The following nonlocal problem for the Laplace equation in a rectangular domain is considered:

$$u_{xx} + u_{yy} = 0,\ 0 < x < 2\pi,\ 0 < y < h, \tag{1}$$

$$u(x,0) = \varphi(x), u(x,h) = \psi(x),\ 0 < x < 2\pi, \tag{2}$$

$$u_x(0,y) = 0, u(0,y) = u(2\pi,y),\ 0 < y < h. \tag{3}$$

Such problems have specific features in comparison with problems with local conditions. For the Laplace equation in an unbounded domain, a similar problem was considered in[1-2], where the classical solution of the problem is studied.

In this paper, we study problem (1)-(3) in a weighted grand Sobolev space with a weight from the Muckenhoupt class. The notion of a strong solution of this problem is defined.

Keywords: Laplace equation, nonlocal problem, weighted grand Sobolev space, strong solution.

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Hyperbolic Functions on Split Quaternions and Their Characteristics

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In the literature, exponential function[1] has been defined on split quaternions using Taylor series expansion, and the definition discussed and restated considering the characteristics of split quaternions. The characterization and properties of exponential function on split quaternion have been investigated[2] via a similar approach. The exponential function on split quaternion matrices has been defined and its properties have been discussed[3].

In this study, hyperbolic functions have been defined with split quaternion variables and their properties and characteristics have been given considering the characteristics of split quaternion variables. Additionally, the hyperbolic functions have been divided into real and scalar parts to facilitate their applicability in composite functions.

Keywords: Split quaternion, hyperbolic function, characteristics, exponential function.

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Surface Pencil with Constant Gaussian Curvature Along a Non-null Curve

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This study obtains surface pencil passing through a given curve with constant Gaussian curvature along this curve in Minkowski 3-space. There results are presented for spacelike curves with spacelike or timelike normal, as well as for timelike curves. The surface pencil passing through these curves are expressed parametrically. Additionally, sufficient conditions are given for these type of surface pencil. Examples are included to aid in visualizing the equations found.

Keywords: Surface pencil, Gaussian curvature, Frenet frame, Minkowski space.

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Rectifying Rose Ruled Surfaces

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In this study, a special type of ruled surface called the rectifying rose ruled surface is investigated in the three-dimensional Euclidean space. This surface is constructed using a rose curve as the base curve and a direction vector defined as an angular linear combination of the unit tangent and binormal vectors of this curve.

After deriving the parametric equations of the surface, fundamental differential geometric properties such as the normal of the surface, the coefficients of the first and second fundamental forms, and the Gaussian curvature are analyzed. Additionally, global properties such as the striction curve and the drall are examined. The geodesic frame defined on the surface is also introduced, and the associated geodesic Frenet formulas are calculated.

In addition to theoretical investigations, the surfaces are visualized using MATLAB, and the effect of the angular variation of the direction vector on the surface geometry is studied. Rectifying rose ruled surfaces generated with different angular values are analyzed and compared.

Keywords: Rose curve, ruled surfaces, rose ruled surfaces.

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The Cross Products on Dual and Dual Lorentzian Spaces

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In the literature, the cross products on the dual spaces $\mathbb{D}^3$ and $\mathbb{D}^7$ and dual Lorentzian space $\mathbb{D}_1^3$ have been defined by using determinant. These cross products are expressed by inner and cross products on the spaces $\mathbb{R}^3, \mathbb{R}^7$ and $\mathbb{R}_1^3$. The cross products on the spaces $\mathbb{D}^3$ and $\mathbb{D}_1^3$ have been restated with the anti-symmetric matrices and their properties have been investigated via this approach.

In this study, the cross products on the dual spaces $\mathbb{D}^4$ and $\mathbb{D}^5$ and the dual Lorentzian spaces $\mathbb{D}_1^4$, $\mathbb{D}_1^5$ and $\mathbb{D}_1^7$ have been stated. Moreover, the cross product on these spaces have restated with the anti-symmetric matrices and their properties have been given via this approach.

Keywords: Cross product, anti-symmetric matrix, dual space, dual Lorentzian space.

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Dielectric Relaxation and Conductivity Characteristics of Gamma-Irradiated $TlGaTe_2$ and $TlInSe_2$ Crystals

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$A^3B^3C_2^6$ group compounds and the mixed crystals based on them constitute a large class of semiconductors with strong anisotropic (chain-like and layered) crystal structures. The physical properties of these crystals, which are analogs of disordered systems (solid solutions) with broken translational invariance of the crystal lattice, remain weakly studied despite their strong anisotropic crystal structures. One of the results of strong disorder in the system is the increased contribution of ion accumulation to the electrical conductivity during measurements, and when the contribution of ion accumulators is 10^6 times greater than that of electrons, the system exhibits the characteristics of superionic conductors.

The electrical and dielectric properties of $A^3B^3C_2^6$ group chain-structured semiconductor crystals in a wide temperature range (80-450 K) have been studied both parallel and perpendicular to the crystallographic "c" axis, with a complex investigation of the effects of radiation.[1] In the framework of the Mott approximation, the density of localized states (N_F), activation energy (E_a), hopping length (R), the energy difference between levels near the Fermi level (ΔE), and the concentration of deep traps (N_t) have been calculated. In the framework of the Pol-Frenkel model, the concentration of ionized centers, the free hopping distance (λ), and the value of the Frenkel coefficient (β) have been calculated, and the potential barrier form has been determined for unirradiated and 250 Mrad irradiated crystals. It has been determined that above room temperature, $TlGaTe_2$ and $TlInSe_2$ compounds transition to the superionic state. The critical transition temperature values for this state have been determined separately for each compound. The study of the temperature-frequency characteristics of the dielectric permeability and electrical conductivity of $TlGaTe_2$ and $TlInSe_2$ crystals revealed strong dielectric relaxation, and the mechanism of this phenomenon was identified. An “S”- shaped switching and a memory effect, accompanied the transition of the crystal to the superionic state during which long-term variable frequency voltage oscillations occurred.

Keywords: Superionic, hopping, activation, relaxation.

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Electrodeposition and Spray Techniques for Pt/Pd Coated Nickel Foam Electrodes

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Supercapacitor (SC) electrodes were prepared by coating porous nickel foam with platinum (Pt) and palladium (Pd) powders using two different methods: electrochemical deposition and spray coating. Cyclic voltammetry (CV) and galvanostatic charge–discharge (GCD) tests were applied to evaluate supercapacitor electrode performance, focusing on specific capacitance, energy and power densities, and cycling stability. Results showed that electrodes coated via electrodeposition showed a broader CV curve and higher current response, highlighting a larger active surface area and better energy storage capability. Moreover, GCD measurements confirmed that the electrodes coated by electrodeposition has higher specific capacitance and energy-power densities. Energy and power density analyses showed that electrodeposited Pd electrodes has the highest overall performance, outperforming both spray coated and Pt based electrodes. Capacitance retention tests also showed that especially electrodeposited Pt electrodes maintained over 70% retention after 2000 cycles, significantly outperforming spray coated ones, so that shows better long-term stability[1-3].

Keywords: Pt, Pd, electrodes, supercapacitor, coating.

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Körük Ventili (Levelling Valve) Hava Akış Karakteristiklerinin Karşılaştırmalı Teknik İncelemesi

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Bu çalışmada, ağır taşıtlarda hava süspansiyon sisteminin yüksekliğini otomatik olarak ayarlayan körük ventillerinin (levelling valve) performans karakteristikleri deneysel olarak incelenmiştir. Yerli üretim ve OEM olmak üzere iki farklı valf, belirli sıcaklık ve basınç koşullarında test edilerek, valf kol açısına bağlı hava akışı değerleri karşılaştırılmıştır.[1] Ayrıca, valflerin teknik yapısının bu performansa etkisi de analiz edilmiştir. Testler, 6 bar sabit basınç altında ve +40° ile -40° kol açıları arasında gerçekleştirilmiştir. Sonuçlar, OEM valfin negatif açılarda egzoz yönünde, yerli üretim Yumak valfin ise pozitif açılarda basınç yönünde daha yüksek hava akışı sağladığını göstermektedir. Genel performans karşılaştırmasında Yumak valfi, yaklaşık %4,5 daha yüksek hava debisi sunmuştur. Her iki valf de test aralığında kararlı ve doğrusal bir akış karakteristiği sergilemiş, bu da süspansiyon sisteminin tepki süresi ve sürüş konforu açısından önemli bulunmuştur.[2]

Bu çalışma sonucunda, körük ventili tasarımı ve seçiminde sadece boyut veya montaj uyumu değil, aynı zamanda valfin içyapısında bulunan yay ve benzeri parçalarla belirlenen hava akış karakteristiklerinin de dikkate alınması gerektiği vurgulanmakta ve bu alanda yapılacak standartlaştırma çalışmalarına katkı sağlamayı hedeflemektedir.[3]

Anahtar Kelimeler: Körük ventili, süspansiyon sistemi, ağır taşıtlar, hava akış karakteristiği.

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Sinop İlinde Nükleer Güç Santrali Öncesi Kabalı Nehrinin Sularında Trityum Radyoaktivitesinin Araştırılması

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Trityum hidrojenin radyoaktif bir izotopudur ve çevredeki yüksek hareketliliği ve biyosferdeki hidrolojik döngüdeki önemi nedeniyle özel dikkat gerektirir[1]. Doğal trityum, atmosferin üst katmanlarında bulunan gazlarla kozmik radyasyonun etkileşimi sonucu oluşur. Trityum ayrıca nükleer güç reaktörlerinde fisyon ve hafif element aktivasyonu ile de üretilir[2]. Bu çalışmada, Türkiye'nin ikinci nükleer santralinin kurulacağı Sinop ilindeki Kabalı deresi sularındaki trityum konsantrasyonları araştırılmıştır. Bu kapsamda Kabalı deresinden (51,3 km) toplam 23 su örneği toplanmıştır. Nehir suyu örneklerindeki trityum konsantrasyonları sıvı sintilasyon sayacı (LSC, PerkinElmer 2910TR) ile ölçülmüştür. LSC, çevresel örneklerde trityumu belirlemek için en yaygın kullanılan tekniktir. Sönümü önlemek için LSC ölçümünden önce numunelere damıtma işlemi uygulanmıştır. Uygulanan yöntem için minimum tespit edilebilir aktivite (MDA) değeri 1,48 Bq/L olarak bulunmuştur. Beş su örneğinin trityum konsantrasyonu MDA'nın altında kalmıştır. Kabalı nehrinden alınan su örnekleri için ortalama trityum konsantrasyonu 2,37 ± 0,48 Bq/L (20,10 ± 4,08 TU) olarak bulunmuştur. Bu çalışma, analiz edilen nehir suyu örneklerinin düşük trityum içeriğine sahip olduğunu ve bu sonuçların TSE, WHO ve USEPA tarafından belirlenen izin verilen trityum doz limitlerinden çok daha düşük olduğunu doğrulamıştır[3].

Anahtar Kelimeler: Radyoaktivite, trityum, nehir suyu, Sinop.

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Surface Engineering of Ti13Nb13Zr Implants Using Microarc Oxidation and Hydroxyapatite-Based Thermal Spraying

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This paper presents an analysis of the formation and characteristics of biocomposite coatings based on hydroxyapatite (HAp) and titanium dioxide (TiO_2) deposited on Ti13Nb13Zr alloy by combined treatment — microarc oxidation (MDO) and subsequent gas thermal spraying. Detonation (DN), cold (CN), and high-speed oxygen-fuel (HVOF) spraying were used as spraying methods. The effect of the electrolyte composition and MDO modes on the morphology, roughness, adhesion strength, and microhardness of the obtained coatings has been studied. It is shown that preliminary microarc oxidation significantly increases the adhesion of the deposited layer by increasing the porosity and roughness of the substrate. The maximum values of adhesion strength and hardness were achieved using the detonation spraying method. Morphological and elemental analysis confirmed the uniformity and density of the structures obtained by this method. The results indicate the high efficiency of the combined approach for creating functional biocompatible coatings intended for use in bone engineering and medical implants.

Keywords: Hydroxyapatite coating, microarc oxidation, detonation spraying, HVOF, titanium alloy.

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A New Force in Nature? The Magnetic Moment of the Muon

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There are four forces in Nature: gravitational, electromagnetic, weak and strong forces. We call it the Standard Model of particle physics. There has been a strong tension between the measured value of the muon's magnetic moment and its Standard Model prediction. This has indicated a new force in physics. The Budapest-Marseille-Wuppertal Collaboration (of which I am the spokesperson) calculated the most important contribution —the one which dominates the uncertainties— to this magnetic moment using lattice QCD. The first result[1] was selected to be one of the breakthroughs of the year 2020 in all Science. Our most recent calculation confirms those findings with an even higher precision and shows that the tension disappeared. As a conclusion the Standard Model is verified up to 12 decimal places[2].

Keywords: Lattice QCD, muon, magnetic moment.

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Dielectric Properties Of $CuTlS_2$ Crystals Studied Via Impedance Spectroscopy

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Determining the potential of semiconducting materials in electrical and optoelectronic applications requires an understanding of their dielectric behavior at different temperatures and frequencies[1,2]. A strong technique for thoroughly examining dielectric relaxation mechanisms and the impact of structural flaws is impedance spectroscopy. In this section, we examine the dielectric characteristics of $CuTlS_2$ single crystals throughout a broad temperature (150–450 K) and frequency (200 Hz to 500 kHz) range, both in their initial state and upon exposure to gamma radiation ($D\gamma$ = 25 Mrad). Insights into charge carrier dynamics, polarization mechanisms, and defect-related inside the crystal lattice are revealed by the measured temperature- and frequency-dependent dielectric responses.

The impedance spectroscopy (IS) measurements were conducted in an evacuated cryostat within the temperature range 150–450 K, using the E7-25 device to detect key parameters such as the real part of the dielectric function, ε(ω). With increasing temperature, the dielectric constant increases to a maximum value, after which an anomaly is observed: a relaxation-like decrease in ε(ω) with further temperature rise. Additionally, as the measurement frequency increases, the peak corresponding to the maximum value shifts to higher temperatures and the magnitude of the peak decreases.

These variations in the temperature-frequency characteristics of dielectric permittivity are typical of Debye-type relaxation processes. The obtained ε(ω, T) dependences suggest the presence of weakly bound electric charges in the crystal lattice of the solid solution, contributing to the observed dielectric behavior.

Keywords: Dielectric behavior, impedance spectroscopy, relaxation processes.

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Effect of Doping and Radiation on the Conductivity Mechanism in Layered GaS Crystals

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Understanding the electrical properties of layered semiconductors is crucial for their application in radiation-sensitive and anisotropy-dependent optoelectronic devices[1-2] . This study aims to investigate the effect of radiation-induced defects on the anisotropic conductivity of Yb-doped GaS crystals and provide a scientific basis for the development of radiation-resistant semiconductors with tunable transport properties. We investigate the temperature-dependent electrical conductivity of GaS single crystals doped with 0.1 at.% Yb in the 125–300 K range, before and following gamma irradiation at doses up to 200 krad. The addition of Yb creates donor (~0.098 eV) and acceptor (~1.14 eV) energy levels, modifying the charge transport mechanism and resulting in anisotropic conductivity behaviour. Gamma irradiation leads to the formation of additional defect states, causing changes in activation energy and the shifting of the thermal quenching region to higher temperatures as the dose increases. Conductivity measurements parallel and perpendicular to the crystallographic c-axis (E∥c and E⊥c) were carried out to evaluate the directional sensitivity to structural defects. The results suggest that Yb atoms may occupy both intralayer and interlayer positions, consequently contributing to the observed anisotropy. The overall transport phenomenon is determined by thermally activated conduction at higher temperatures and possible tunnelling effects at lower temperatures.

Keywords: Yb-doped GaS, electrical conductivity, gamma irradiation, anisotropy, activation energy.

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Prospects of Thermal Waters Usage in Small Power Industry

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In Azerbaijan, the installed electricity capacity last years was 8,090.8 MW, of which 6,642.0 MW was generated from 22 thermal power plants (TPPs) using organic fuel (natural gas), 1,301.8 MW from 46 hydroelectric power stations (including 35 small river plants), 66.45 MW from wind, 51.9 MW from solar, and 37.7 MW from bioenergy stations. The annual electricity production is 29,004,300 MWh, of which 2,997,500 MWh is exported. However, the country has set a goal to increase the share of renewable energy sources in the total energy balance to 30% by 2030. Estimates indicate that Azerbaijan's renewable energy reserves total up to 27,000 MW, including 23,000 MW from solar, 3,000 MW from wind, 380 MW from bioresources, and 520 MW from small rivers. Intensive efforts are underway to explore other natural energy sources in the country's economy, particularly small-scale energy.[1]

Azerbaijan has abundant geothermal water reserves, with a small portion currently being used for various purposes. One way to utilize them is in small-scale energy systems for heating homes, social facilities, medical and health purposes, tourism, and recreation, among others. In Azerbaijan's thermal water sources, the water temperature reaches 90–95°C. In total, 15% of the sources have been geologically explored, and it has been shown that their operational reserves reach 250,000 cubic meters per day.[2] Higher values of these stocks can be expected and it is necessary to find effective ways of using them. Practically, in all ways of using thermal waters, it is necessary to study their ecological characteristics. This includes the content of radionuclides (such as radon), heavy metals, and mineral components in general.

Keywords: Thermal water, renewable energy.

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(E)-2-(2,4-Dihidroksibenziliden)Tiyosemikarbazon ve (E)-2-[(1H-İndol-3 İl)Metilen]Tiyosemikarbazon Komplekslerinin Yapısal ve Spektroskopik Özelliklerinin DFT Metoduyla İncelenmesi

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(E)-2-(2,4-dihidroksibenziliden)tiyosemikarbazon (**1**) ve (E)-2-[(1H-indol-3-il)metilen] tiyosemikarbazonun (**2**) komplekslerin optimize moleküler geometrisi, titreşim frekansları, ^{1}H NMR ve ^{13}C NMR spektrumları HSEhIPBE/6-311++G(d,p) ve B3LYP/6-311++G(d,p) yoğunluk fonksiyon teorisi (DFT) metotları kullanılarak hesaplandı. NMR kimyasal kaymaları, moleküllerin moleküler yapısı ve elektronik özellikleri arasındaki ilişkiyi anlamak için oldukça yararlıdır. Bir molekülün moleküler reaktifliği elektrik ve optik özelliklerinin tanımlanmasında Frontier molekül orbitali (FMO) önemlidir. Komplekslerin frontier molekül orbitalleri ve buna bağlı η, χ, μ ve S parametreleri aynı metotlar kullanılarak hesaplanmıştır. Kompleks **1** ve **2**'nin yapısal ve spektroskopik parametrelerinin elde edilen teorik sonuçları deneysel[1] sonuçlar ile karşılaştırıldı. Elde edilen sonuçlar teorik ve deneysel[1] arasında bir uyum olduğunu göstermiştir.

Anahtar Kelimeler: Yoğunluk fonksiyon teorisi, moleküler geometri, IR, nükleer manyetik rezonans.

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Optimization of Ion-Plasma Nitriding Parameters for Ti-6Al-4V Titanium Alloy

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This study presents the optimization of ion-plasma nitriding parameters for Ti-6Al-4V alloy. The samples were treated at temperatures ranging from 400 to 800 °C for durations of 1–3 hours. The investigation included measurements of microhardness and elastic modulus, as well as microstructural analysis via SEM and XRD methods. It was found that the best mechanical properties were achieved at 650 °C for 3 hours, resulting in a maximum hardness of 737.4 HV and an elastic modulus of 166.9 GPa, which is attributed to the formation of a dense nitride layer. A further increase in temperature above 700 °C led to a decrease in hardness, likely due to grain growth and degradation of the surface structure[1-2].

Phase analysis confirmed the formation of titanium nitrides (TiN, Ti_2N), which contribute to the hardening effect[3–4]. The obtained results allowed the determination of optimal nitriding parameters that significantly improve the surface mechanical properties. This development provides a promising approach for enhancing the durability of Ti-6Al-4V components used in high-load engineering applications and biomedical implants.

Keywords: Ti-6Al-4V, nitriding, ion-plasma treatment, microhardness, elastic modulus.

Acknowledgments: This research is funded by the Committee of Science of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP19680457).

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Enhancement of Visible-Light-Driven Photocatalytic Activity in Gd-Doped CdZnS Nanocomposites

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In this study, gadolinium (Gd)-doped CdZnS nanocomposites were synthesized to address these challenges and enhance photocatalytic performance under visible light irradiation. Structural analyses confirmed the successful incorporation of Gd^{3+} ions into the CdZnS lattice, inducing favorable modifications in crystallinity and morphology. Optical measurements revealed a red shift in the absorption edge and a reduction in bandgap energy, indicating improved light-harvesting ability in the visible spectrum[1-2]. Photoluminescence (PL) analysis demonstrated suppressed electron-hole recombination due to the presence of Gd-induced defect states, contributing to enhanced photocatalytic efficiency. The photocatalytic activity was evaluated through the degradation of Rhodamine B dye under visible light, where Gd-doped CdZnS exhibited significantly higher degradation rates compared to the undoped counterpart[3]. Additionally, the doped nanocomposites maintained their catalytic stability over repeated cycles. These findings highlight the potential of Gd doping as a strategy to tailor the electronic and structural properties of CdZnS-based photocatalysts, making them suitable for various environmental and optoelectronic applications.

Keywords: Photocatalysis, Gd-doping, CdZnS, visible light.

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CHEMISTRY

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Particle Size Analysis of Polymer-Based Metal Nanoparticles Using DLS Method

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Particle size is a crucial parameter for supported metal catalysts, as it can significantly influence their activity and selectivity[1,2] . In certain cases, obtaining particle size information quickly and cost-effectively is essential. While chemisorption techniques offer a more affordable alternative, they are not always suitable for supported metal catalysts. Various factors, such as surface contamination, strong metal-support interactions (SMSI), and spillover effects, can alter the stoichiometric ratio between adsorbate molecules and surface metal atoms during chemisorption measurements. Consequently, the development or adaptation of cost-effective, sensitive, and straightforward methods for particle size determination in supported catalysts remains a relevant challenge. One promising approach in this regard is Dynamic Light Scattering (DLS), which provides a rapid and inexpensive means of measuring particle size. Studies have shown that DLS results generally correlate well with those obtained from TEM analysis. In this way it allows to use more simple, sensitive and fast methods for measures of particle sizes in supported catalysts[2]. For this purpose, PVP/Ni[3] and PVP/Gelatin/Ni[4] metal-supported catalysts were synthesized. Notably, DLS analysis revealed that the average particle size of nanoparticles in the PVP/Ni complex and the PVP/Gelatin/Ni complex was 10.6 nm and 7.5 nm, respectively.

Keywords: Supported metal catalysts, particle size, DLS method.

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The Study of The Swelling Ratio of Gum Arabic and Acrylamide Hydrogel in Solutions with Different pH

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Hydrogels are polymer-based materials capable of absorbing water, swelling, and holding a significant amount of water within their structure without dissolving. One of their key properties is the swelling rate, which can be evaluated by measuring the swelling capacity over time through free-absorbency tests conducted at regular intervals. This study aims to synthesize a physical hydrogel using gum arabic (GA) and acrylamide (AM), and to examine its swelling behavior in solutions with different pH. The successful synthesis of the grafted hydrogel and its structural characteristics were confirmed using FTIR, SEM, and XRD analyses[1]. In the synthesis, gum arabic polymer was used as the primary raw material, acrylamide as the monomer, ammonium persulfate (APS) as the initiator, and N,N-methylenebisacrylamide (MBAA) as the crosslinking agent. Subsequently, the swelling ratio of the resulting copolymer was examined by immersing it in solutions with different pH values for 24 hours, allowing the evaluation of water absorption and the hydrogel's swelling behavior[2]. As this synthesis process is intended for future application in drug delivery systems, the selected pH values (1, 2, 6 and 7) were chosen to reflect the most relevant natural physiological conditions. Overall, all samples demonstrated a substantial absorption capacity within the first 24 hours. The swelling behavior of GA-AM hydrogel in a given solvent determined by calculating the fractional change in weight relative to its initial dry weight. This is expressed as $SRW = (W - W_o)/W_o$, where W represents the weight of the swollen sample and W_o is the weight of the dry sample[3]. Among the samples of the GA-AM hydrogel exhibited the highest swelling ratio up to 490 ± 4% at pH 2. It should also be noted that the amount of crosslinking agent added was equivalent to 15% of the polymer amount.

Keywords: Hydrogels, gum arabic, acrylamide, swelling ratio.

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Synthesis, Structure, and Properties of New Alicyclic and Aromatic Amidophosphates

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Research into methods for synthesizing new functionally substituted derivatives of amidophosphonates of the alicyclic and aromatic series, elucidating their structures, and identifying biologically active compounds among them is largely driven by their unique set of chemical properties and broad spectrum of biological activity. Further development of both theoretical and applied aspects of our research is focused on designing synthesis methods for new amidophosphates and their modified derivatives using the Todd-Atherton reaction under microwave irradiation. As a result, the following compounds were isolated and characterized: dialkyl-N-(1-ethynylcyclohex-1-yl)amido-phosphates, N,N'-diethylenimino- and (N,N'-tetramethylamino)-N''-(1-ethynylcyclohex-1-yl)triamidophosphates, dialkylphenylphosphoramidates, and tetraalkyl 1,3-phenylenebis-(phosphoramidates).[1-2] Furthermore, biological testing of these compounds has identified agents demonstrating high biologocal activity concerning the growth, development, and yield of agricultural crops.[3]

Keywords: Amidophosphates, Atherton-Todd reaction, biological activity, microwave irradiation.

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Development of Lead-Free Epoxy Resin Composites for X-Ray Shielding

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The increasing demand for sustainable and effective radiation shielding materials has driven the search for alternatives to traditional lead-based shields[1,2]. This study investigates lead-free epoxy resin composites incorporating Bi_2O_3 and $BaSO_4$ powders for X-ray shielding. Composites were fabricated using open mold casting and characterized via FTIR, SEM and XRD. Radiation shielding efficiency was assessed using ^{241}Am and ^{137}Cs gamma sources in a gamma spectroscopy setup at the Institute of Radiation Problems, Azerbaijan. Shielding performance was analyzed through mass attenuation coefficients and half-value layer (HVL) at 60 keV and 120 keV. Mechanical properties, including tensile strength and thermal stability, were also measured. Bi_2O_3/$BaSO_4$-based composites demonstrated excellent radiation attenuation comparable to lead-based materials, while maintaining lightweight and flexible characteristics. This study underscores the potential of epoxy resin composites as sustainable alternatives for X-ray shielding. Future research will focus on improving dispersion techniques to enhance homogeneity and shielding performance.

Keywords: Epoxy resin, lead-free shielding, radiation protection, X-Ray Shielding.

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Alunit Cevherinin RSM Kullanılarak Liçinin Optimizasyonu

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Araştırmada, alunit cevherinin NaOH ile muamelesi sırasında çözeltiye geçen maksimum alüminyum miktarı ve minimum fosfor miktarı RSM ampirik modeli kullanılarak incelenmiştir[1]. Bu amaçla, Box-Behnken tasarım yöntemi kullanılarak üç farklı parametrenin (işlem süresi, işlem sıcaklığı ve sıvı-katı oranı) etkileri araştırılmıştır[2]. Deneyler 20-80 °C, 30-270 dk ve 5-95 mL/g aralığında yürütülerek, proses için optimum koşullar belirlendi. RSM kullanılarak önerilen model denkleminin deneysel verilerle iyi bir uyum gösterdiği ve model için R2=0,7572, R2=0,9792 korelasyon katsayılarının belirlendiği görülmüştür. Bu aşamada optimum koşullar NaOH konsantrasyonu: %7, yıkama süresi: 30 dk, yıkama sıcaklığı: 69 ºC, sıvı/katı oranı: 56 mL/g olarak belirlendi. Bu optimum koşullar altında çözeltiye geçen alüminyum miktarı %89, fosfor miktarı ise %18 olmuştur. . Alunitin mineralojik analizleri X-ışını kırınımı (XRD, Shimadzu XRD-6000) kullanılarak yapıldı ve morfolojik yapısı taramalı elektron mikroskobu (JEOL JSM 7001F FE-SEM) kullanılarak karakterize edildi. Alunitlerin kimyasal bileşimi XRF cihazı (Rigaku Primus IV) kullanılarak belirlendi ve elde edilen oksitlenmiş bileşen sonuçları elementel sonuçlara dönüştürüldü.

Anahtar Kelimeler: Alunit, alüminyum, fosfor, RSM.

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Synthesis of Green Chemistry-Based Catalyst for Carbon Monoxide Neutralization

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Literature analysis shows that synthesis and research based on green chemistry have been rapidly developing recently. The basic principle of green chemistry is the study of chemical products and processes that reduce or eliminate the use of environmentally hazardous substances[1,2]. At the same time, catalytic oxidation of carbon dioxide is very actual issue. As we know, carbon monoxide is one of the toxic substances emitted into the atmosphere. Therefore, its oxidation to carbon dioxide is one of the important problems[3].

The salts $Fe(NO_3)_3 \cdot 9H_2O$ and $Cu(NO_3)_2 \cdot 4H_2O$ were used as precursors for the synthesis of copper iron system. Pomegranate peel extract is additionally used here. Firstly, the salts are dissolved in a small amount of distilled water, then pomegranate peel extract is added. It is mixed by heating to 80-90^{0}C in a magnetic stirrer for 1 hour. Then heated in a drying cabinet, igniting at a temperature of 175-200^{0}C to form a powder. Finally, it is thermally treated for 4 hours in a muffle furnace at 500^{0}C.

The specific surface area of the sample was determined by low-temperature nitrogen adsorption using the BET method on a SORBI-MS device (ZAO META, Russia). The specific surface area of the obtained powder was determined by low temperature nitrogen adsorption by the BET method and as a result showed 36 m^2/g. The catalytic activity of the sample in the oxidation of CO in CO_2 in the 180^0 temperature was determined.

Keywords: Green chemistry, pomegranate peel extract, carbon monoxide.

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BIOLOGY

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Potential Use of Watermelon Seed Oil as an Alternative Linoleic Acid Source Enhanced by Coffee-Derived Caffeic Acid in Cholesterol Treatment

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Cardiovascular diseases remain the leading cause of death worldwide, with dyslipidemia and elevated LDL cholesterol levels playing a central role. One critical nutritional factor contributing to this issue is the excessive consumption of omega-6-rich vegetable oils, particularly corn and sunflower oil, which are widely used as primary dietary sources of linoleic acid (LA), an essential omega-6 fatty acid. While LA is required for the synthesis of arachidonic acid—a molecule involved in inflammation and neural transmission—its disproportionate intake can lead to metabolic imbalances and pro-inflammatory states when the omega-6 to omega-3 ratio is disrupted.[1]

This study proposes watermelon seed oil as a lesser-known yet promising alternative source of linoleic acid, offering a more moderate concentration that may help mitigate the risks associated with excessive omega-6 intake. Additionally, the research investigates the potential synergy between LA and caffeic acid, a phenolic compound naturally present in coffee. Literature review suggests that caffeic acid can enhance the solubility and bioavailability of linoleic acid, potentially increasing its absorption efficiency and functional value when co-administered.

We hypothesize that integrating a controlled extract of watermelon seed oil into coffee, a globally consumed beverage, could serve as a novel, functional approach to essential fatty acid supplementation. This model not only utilizes an agricultural byproduct that is often discarded but also provides a nutritional strategy that aligns with public health goals aimed at reducing cardiovascular risk. Although empirical validation through laboratory experimentation is still needed, the conceptual foundation bridges nutritional biochemistry, food science, and preventive medicine.

Keywords: Linoleic acid, watermelon seed oil, LDL cholesterol, caffeic acid, functional nutrition, cardiovascular health.

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Bazı Yonca (*Medicago sativa* L.) Genotiplerinin iPBS-retrotranspozon Markörleri ile Genetik Çeşitliliğin Değerlendirmesi

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Yonca, dünya çapında 32 milyon hektarlık küresel üretim alanı ile dünyada en çok yetiştirilen yem bitkisidir.[1] Ayrıca biyoenerji, insan gıdası ve moleküler tarım gibi farklı kullanım alanları da vardır.[2] Bu çalışmada, Türkiye'nin farklı bölgelerinden toplanan 88 adet yonca genotipi ve 6 adet ticari yonca çeşidinin genetik çeşitliliğinin 10 adet po limorfik iPBS-retrotranspozon belirteci ile belirlenmesi amaçlanmıştır. Çalışma sonucunda 10 primerden toplam 351 polimorfik bant elde edilmiş olup, 2074 ve 2075 numaralı primerler 41 adet ile en fazla alel sayısını üretmiştir. Ortalama polimorfizm bilgi içeriği (PIC) 0,31 olarak kaydedilmiştir. Genetik çeşitlilik indeksleri ortalama 0,32 gen çeşitliliği (h) ve 0,49 Shannon bilgi indeksi (I) değerlerini göstermiştir. Komşu birleştirme analizi tabanlı kümeleme, tüm genotipi iki gruba ayırmıştır. Türk yonca germ plazması, yeni çeşitlerin dayanıklılığını ve verimliliğini artırmayı amaçlayan ıslah programları için hayati önem taşıyan önemli bir genetik çeşitlilik sergilemektedir.

Anahtar Kelimeler: Yonca, genetik çeşitlilik, iPBS-retrotranspozon markörleri, bitki ıslahı.

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γ (Gama) Işınlarıyla Muamelenin Bitkilerde Tuz (NaCl) Stresine Tepkisi

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Bilindiği üzere, günümüzde ekolojik problemlerin arttığı bir dönemde bitkilerin gelişiminin zayıflaması ve hatta tamamen yok olması süreçleri hızla devam etmektedir. Bu süreçlerin artmasında antropojen etkilerin rolü büyüktür. Ekolojik krizin şiddetlendiği bir dönemde, çevrenin stres koşullarında bitkilerin büyüme ve gelişimi zayıflamaktadır. Abiyotik stres faktörleri, kültür bitkilerinin gelişiminin yaklaşık %30 - 35 oranında azalmasına neden olmaktadır. Aynı zamanda insan nüfusunun kitlesel şekilde artması, gıda ürünlerine olan talebin de artmasına yol açmaktadır. Bu nedenle, stres koşullarında yetişip ürün verebilen bitki türlerinin geliştirilmesi uygun görülmektedir. Dünya genelinde tarıma elverişli toprakların yaklaşık %20'si tuzlanmaya (şorlanmaya) maruz kalmıştır. Tüm bunlar göz önüne alındığında, ekolojik açıdan kirlenmiş alanlarda yetişip ürün verebilen bitki türlerinin geliştirilmesi temel hedeflerden biridir.[2-3] Tuz stresinin etkisine bitkilerde ilk olarak kök hücreleri maruz kalır. Araştırma çalışmasında, γ ışınlarıyla muamele edilmiş tohumların tuz (NaCl) stresi koşullarındaki gelişimi incelenmiştir. γ ışınlarıyla farklı dozlarda muamele edilmiş bitkilerin, düşük dozlarda daha fazla direnç kazandığı belirlenmiştir. Işınlanmış tohumların tuz stresine karşı yanıt reaksiyonlarını incelemek amacıyla, MDA ve H_2O_2 miktarının yanı sıra, antioksidan bir enzim olan katalaz enziminin aktivitesi de değerlendirilmiştir. Araştırmamızın sonuçları göstermektedir ki, tohumların ekiminden önce 10 Gy ışın dozu ile muamele edilmesi durumunda, nispeten düşük tuz konsantrasyonlarında (1-10 mM) malondialdehit, hidrojen peroksit ve katalaz miktarındaki değişim, oksidatif stresin azaldığını gösterebilir. Tahmin ediyoruz ki, tohumların ekiminden önce 10 Gy ışın dozu ile muamele edilmesi, 1-10 mM tuz (NaCl) konsantrasyonunda bitkilerin tuzluluğa karşı direncini artırabilir.[1]

Anahtar Kelimeler: Y (Gama) ışınlanması, tuz stresi, MDA, H2O2, katalaza.

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ABSTRACTS OF ACCEPTED ORAL PRESENTATIONS NOT PRESENTED AT THE SYMPOSIUM

MATHEMATICS

YTÜ FEN EDEBİYAT FAKÜLTESİ YTÜ FACULTY of ARTS and SCIENCES
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On Solvability an Inverse Value Problem for the Boussinesq-Love Equation with Nonlocal Integral Conditions

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Let $T > 0$ be some fixed number and denote by $D_T = \{(x,t): 0 \le x \le 1,\ 0 \le t \le T\}$. Let us consider a one-dimensional inverse problem of identifying an unknown triple of functions $\{u(x,t), a(t), b(t)\}$ – for the following Boussinesq-Love equation[1]

$$u_{tt}(x,t) - \alpha u_{txx}(x,t) - \beta u_{xx}(x,t) = a(t)u(x,t) + b(t)g(x,t) + f(x,t) \tag{1}$$

with the nonlocal conditions

$$u(x,0) = \int_0^T p_1(t)u(x,t) + \varphi(x),\quad u_t(x,0) = \int_0^T p_2(t)u(x,t) + \psi(x)\quad (0 \le x \le 1) \tag{2}$$

Neumann boundary condition

$$u_x(0,t) = 0\ (0 \le t \le T), \tag{3}$$

nonlocal integral condition

$$\int_0^1 u(x,t)dx = 0\quad (0 \le t \le T) \tag{4}$$

and overdetermination conditions

$$u(0,t) = h_1(t)\ (0 \le t \le T), \tag{5}$$

$$u(1,t) = h_2(t)\ (0 \le t \le T), \tag{6}$$

where $\alpha > 0, \beta > 0$ are known numbers, $f(x,t)$, $g(x,t)$, $\varphi(x)$, $\psi(x)$, $p_i(t), h_i(t) (i = 1,2)$ are given sufficiently smooth functions of $x \in [0,1]$ and $t \in [0,T]$.

We introduce the following set of functions

$$\tilde{C}^{2,2}(D_T) = \{u(x,t): u(x,t) \in C^{2,2}(D_T), u_{ttxx}(x,t) \in C(D_T)\}.$$

Definition: *The triple of* $\{u(x,t), a(t), b(t)\}$ – *is said to be a classical solution to the problem (1)-(6), if the functions* $u(x,t) \in \tilde{C}^{2,2}(D_T)$, $a(t) \in C[0,T]$, $b(t) \in C[0,T]$ *satisfies an equation (1) in the region* D_T *, the condition (2) on* $[0,1]$*, and the statements (3)-(6) on the interval* $[0,T]$ *ordinary meaning.*

We obtain existence and uniqueness theorems for the solution of the inverse problem of the simultaneous determination of the right-hand side and the lowest coefficient.

Keywords: Inverse problem, nonlocal integral condition, classical solution.

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Mathematical Modeling of Investment Risks in the Construction Sector Using Fuzzy Logic

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Effective risk management is key to successful construction investments, as factors like financial instability, contractor reliability, and legal risks can impact outcomes. This paper proposes using fuzzy logic to assess these risks, offering a more accurate and adaptive evaluation. A fuzzy inference system (FIS) calculates a composite risk index, improving risk predictions. Tested on projects in Azerbaijan, it integrates expert opinions and data, aiding better decision-making, planning, and risk mitigation. Step 1: Defining Variables. Step 2: Fuzzy Logic System. A fuzzy inference system (FIS) is developed to process these risk factors using Mamdani or Sugeno methods, producing a quantifiable output. Step 3: Risk Assessment Using FIS. Step 1: Transform these values into fuzzy categories: Contractor reliability: 'high' (8); Financial stability: 'medium' (5); Legal uncertainty: 'high' (7); Step 2: Apply fuzzy logic rules to assess the risk. In this scenario, high contractor reliability and medium financial stability result in medium risk. However, high legal uncertainty increases the overall risk. Step 3: The fuzzy system will output an overall risk score, either medium or high, indicating the necessity for further risk management strategies. Step 4: Risk Forecasting Across Projects. Using the obtained data, risks for other company projects can be calculated: Low Risk: 60% of projects (high contractor reliability, high financial stability, low legal uncertainty); Medium Risk: 30% of projects (medium contractor reliability, medium financial stability, medium legal uncertainty); High Risk: 10% of projects (low contractor reliability, high legal uncertainty). Using fuzzy logic for investment risk modeling in construction improves accuracy and flexibility in risk assessments. Unlike traditional methods, it combines expert judgment with quantitative analysis, providing a deeper understanding of potential risks. This approach enhances project management and reduces financial losses.

Keywords: Fuzzy logic, risk management, construction investment, project risk assessment, uncertainty modeling.

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Ağırlıklı Standart Olmayan Banach Uzaylarında Harmonik Fonksiyonların Yapısal Analizi

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Bu çalışma, ağırlık yapısına sahip standart olmayan Banach fonksiyon uzaylarında tanımlı harmonik fonksiyonların norm sürekliliği ve sınır değer davranışlarını incelemektedir. Mucenhoupt sınıfına ait ağırlık fonksiyonları ve yeniden düzenleme altında değişmeyen norm yapıları çerçevesinde bu fonksiyonların analitik özellikleri araştırılmıştır. Poisson çekirdeği, Hilbert dönüşümü ve Boyd indisleri gibi klasik analitik araçlar yardımıyla, Hardy tipi uzaylarda tanımlı bazı singüler integral operatörlerinin sınırlılığı analiz edilmiştir. Operatörlerin norm sürekliliği ve fonksiyonel yapılarla etkileşimleri, Boyd indisleri aracılığıyla karakterize edilmiştir. Elde edilen bulgular, ağırlıklı fonksiyon uzaylarında tanımlı sınırlı operatörlerin yapısını ortaya koymakta ve potansiyel teorisi ile sınır değer problemleri gibi alanlarda teorik katkılar sunmaktadır.

Anahtar Kelimeler: Harmonik fonksiyonlar, ağırlıklı Banach uzayları, boyd indisi, Hardy uzayları, operatör teorisi.

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Structural Properties of the $h_p(X)$ Class of X-Valued Harmonic Functions

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In this work, we study the class $h_p(X)$ of X-valued harmonic functions defined on the unit disc, where X is a UMD space and $1 < p < \infty$. The space is constructed using X-valued trigonometric series in the Bochner space $L_p([-\pi, \pi); X)$, and the t-basis property of the exponential system is established. This structure provides the foundation for analysing boundary value problems, particularly the Laplace equation with directional derivative conditions. It is proved the Fredholmness of this problem.

Additionally, harmonic and analytic X-valued function spaces are examined, including their relationship through generalized Cauchy-Riemann equations derived from a *-involution on X. A vector-valued version of Fatou's theorem is also established. The study introduces derivative-based subspaces of $h_p(X)$, and the index of associated boundary value problems is computed[1-4].

Keywords: X-valued harmonic functions, Noether, Fredholm, Bochner space.

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Exact Solutions of the Time fractional Benney-Luke Equation and the Second Order Benjamin-Ono Equation

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In this study, we obtain the exact solutions of the time-fractional non-linear Benney-Luke equation and the second order Benjamin-Ono equation, which are difficult to solve analytically by converting them into ordinary differential equations using a conformable derivative transformation and the exponential function method. This method helps us examine the behavior of the solutions and understand the effects of different parameter values on them. We also present graphical illustrations of some solutions for different values of the parameters in our study.

Keywords: Benney-Luke equation, Benjamin-Ono equation, exponential method, conformable derivative, exact solutions.

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Lipschitz Stability Analysis of Nonlinear Set-Valued Differential Equations with Initial Time Differences

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In this paper, we examine the connection between an unperturbed set-valued differential system and a perturbed one, where the systems differ in both initial conditions and initial times. By applying the variation of parameters method, we derive integral representations of solutions and establish Lipschitz stability criteria for nonlinear set-valued differential systems. A comparison is also made between general stability and Lipschitz stability to emphasize their differences. The theoretical background and criteria are inspired by earlier contributions on initial time difference stability and Lyapunov-based analysis[1–3].

Keywords: Lipschitz stability, variation of parameters, set-valued differential equations, perturbations, initial time difference.

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Orlicz-Sobolev Uzaylarında Yerel Olmayan Bir Problemin Güçlü Çözülebilirliği

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Bu çalışmada sınırsız bir bölgede Laplace denklemi için yerel olmayan bir problem ele alınmış ve bu problem için güçlü çözüm kavramı tanımlanmıştır. Spektral problemin kök fonksiyonlar sisteminin Orlicz uzayı için bir baz oluşturmasından yararlanılmıştır. Simetrik uzaylar için Boyd indeksleri kavramı kullanılarak spektral yöntem uygulanmış ve Orlicz normu tarafından tanımlanan Sobolev uzaylarında problemin güçlü çözülebilirliği gösterilmiştir. Bu çalışmada ilk kez Orlicz-Sobolev uzaylarında çözümün varlığı ve tekliği ortaya konmuştur. Orlicz-Sobolev uzaylarında problemi çözmek, daha genel bir yapıya sahip olan simetrik Sobolev uzaylarına çözümün genelleştirilmesinin önünü açacaktır.

Anahtar Kelimeler: Orlicz-Sobolev uzayları, Laplace denklemi, yerel olmayan problem, güçlü çözüm.

Teşekkür Bölümü: Bu çalışma Yıldız Teknik Üniversitesi Bilimsel Araştırma Projeleri Koordinasyon Birimi tarafından desteklenmektedir (Proje ID:6596, Proje Kodu: FBA -2025-6596).

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Ülke İçinde Karayolu ile Yük Taşımacılığı

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Makalede karayoluyla eşya taşımacılığı anlatılmaktadır. Ülkemizde gerçekleştirilen hızlı yapılaşma, nüfus artışı, bölgelerimizin gelişmesi ülke içinde yük taşımacılığı hizmetlerine olan ihtiyacı artırmaktadır. Yük taşımacılığında taşımacılık mevzuatlarına uymanın yanı sıra, müşterinin gereksinimlerini karşılamak, beklentilerini karşılamak ve onları memnun etmek de çok önemlidir. Ancak, rekabet ortamında yük taşımacılığı faaliyetinde bulunan girişimci veya işletmelerin (kamu veya özel) tüm bu gereklilikleri yerine getirmenin yanı sıra, kullandıkları araçların teknik işleyişini de denetlemeleri gerektiği unutulmamalıdır. Aynı zamanda aracı kullanan sürücünün, gidilecek yere göre çalışma programı da dikkate alınmalıdır.

Yükün cinsine, minimum maliyetle taşınacak araca, yükün parametrelerinin doğru bir şekilde incelenmesi, acil olup olmadığı vb. bilgilerin kayıt altına alınması ve tüm bunlar göz önünde bulundurularak uygun aracın belirlenmesi gerekmektedir. Acil kargoların özel şartlarda taşınabilmesi esastır. Taşınma işlemi yapılmadan önce, gerekli değerlendirmenin yapılabilmesi için adreste önceden inceleme yapılmalı ve buna göre değerlendirme yapılmalıdır. Türüne göre kargo paketlemesi ve gerekirse işçilik hizmeti de sunulmalıdır. Değerlendirme sırasında tüm bunların dikkate alındığının müşteriye bildirilmesi gerekmektedir. Bu ve bunun gibi birçok parametrenin tek merkezden erişilebilir ve yönetilebilir olmasını sağlayacak bir yük bilgi yönetim programının geliştirilmesi önerilmektedir.

Anahtar Kelimeler: Yük sınıflandırması, taşıma süreci, lojistik yazılımı, taşıyıcı firma, GPS izleme.

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Fe-Si-C Amorf Şerit Numunelerinin Araştırılması ve Kristal Fe-Si Muadilleri ile Karşılaştırılması

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Amorf malzemeler, uzun menzilli atomik düzen eksikliği ile karakterize edilir ve benzersiz fiziksel ve mekanik özelliklerinden dolayı kristal muadillerine kıyasla umut verici alternatifler olarak kabul edilir. Fe-Si-C amorf şerit numunelerinin araştırılması, yumuşak manyetik özellikleri, enerji verimliliği ve mühendislik malzemeleri olarak çeşitli koşullardaki potansiyel uygulamaları hakkında önemli bilimsel bilgiler sağlar[1]. Bu şeritlerin karakteristik manyetik özellikleri arasında düşük koersif kuvvet, yüksek doyum manyetizasyonu, düşük enerji kaybı vb. bulunur[2]. Fe-Si-C amorf şeritlerinin manyetik özellikleri, elektrik motorlarında, transformatörlerde ve yüksek verimlilik gerektiren cihazlarda kullanımları için cazip hale getirir. Göreceli olarak yüksek Curie sıcaklıkları – manyetik özelliklerini geniş bir sıcaklık aralığında koruma yeteneği – çalışma sıcaklıklarının önemli ölçüde dalgalandığı uygulamalara uygun olmalarını sağlar.

Araştırmalar, Fe-Si-C amorf şerit numunelerinin karbon ve silikon içeriklerini ayarlayarak manyetik özelliklerin yapay olarak ayarlanabileceğini göstermiştir. Bu uygulama, özel alanlar için manyetik malzemelerin geliştirilmesinde benzersiz fırsatlar sunar.

Araştırmanın temel amacı, bu amorf şeritlerin manyetik özelliklerinin sıcaklık kararlılığı ve enerji verimliliği hakkında kristal Fe-Si muadilleriyle karşılaştırıldığında daha kapsamlı bilimsel veri sağlamaktır. Gelecek araştırma yönleri olarak, bu şeritlerin işlenme teknolojisinin simüle edilmesi ve yeni örneklerin oluşturulması kapsamında çalışmaların derinleştirilmesi önerilmektedir.

Anahtar Kelimeler: Fe-Si-C amorf şerit, enerji verimliliği, elektrik mühendisliği malzemeleri.

Teşekkür Bölümü: Bu çalışma, Azerbaycan Bilim Fonu'nun (Azərbaycan Elm Fondu) mali desteğiyle gerçekleştirilmiştir. Hibe No: AEF-MQM-QA-2-2023-3(45)-05/01/1-M-01.

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Basicity of a Trigonometric System in Morrey-type Spaces

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We study the basis property of the trigonometric system $T = \{\cos(nx),\ x\sin((n+1)x)\}_{n\in N}$ in the Morrey space $L_{p,\lambda}(0,2\pi)$, focusing on its application to a degenerate elliptic boundary value problem for $m \geq -2$. Morrey spaces are suitable for studying regularity in partial differential equations[1,2]. Motivated by the application of basis systems to such problems[3], we consider a separable subspace $\hat{L}_{p,\lambda}(0,2\pi)$ in which $C_0^\infty(0,2\pi)$ is dense.

We construct the system

$$t_0^+ = 1, t_n^+ = \cos(nx), t_n^- = x\sin(nx),$$

and its biorthogonal functionals $\phi_n^\pm$, and prove that the system is minimal and complete in $\hat{L}_{p,\lambda}(0,2\pi)$. Consequently, we obtain that the system T forms a basis in non-separable Banach space $\mathcal{L}_{p,\lambda}\ (0,2\pi)$. The system T has also the Riesz Property.

Keywords: Morrey space, Riesz basis, trigonometric system, degenerate elliptic equation.

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Electron Screening Meets Space: D+D Fusion-Driven Propulsion Systems

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Material enhanced electron screening in Deuterium+Deuterium fusion reactions[1] has the potential to reduce the effective Coulomb barrier, significantly increasing fusion rates at low energies. This effect, observed in metallic lattices[2], may open a novel route toward compact nuclear micro propulsion systems for miniaturized spacecraft. In this study, we explore how the choice of deuterated target materials especially those with high electron densities and structured metallic meshes could influence reaction rates through screening induced enhancements as well as neutron suppression using unusual materials[2]. We assess how such systems could generate usable thrust in space without requiring high-energy acceleration or bulky reactors. By tailoring the fusion environment at the atomic level, screening assisted D+D fusion may offer a clean, scalable, and isotopically safe propulsion method for CubeSat class missions, particularly suited for long-duration or attitude control applications. By enabling compact, fuel-efficient, and neutron-safe thrust, screening-enhanced D+D fusion systems hold great promise for future applications in space mining operations and sustained interplanetary travel.

Keywords: Electron screening effects, enhancement of fusion, space mining, interplanetary travel.

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Constraining Key Resonances in the $^{40}Ca(p,\gamma)^{41}Sc$ Reaction via ANC-Assisted DWBA Analysis of Transfer Reactions and its Astrophysical Reaction Rate

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We present a novel investigation of the $^{40}Ca(p,\gamma)^{41}Sc$ reaction, which plays a critical role in nucleosynthesis processes in ONe novae. In particular, the low-energy resonances at E_R=647 keV and 1842 keV dominate the reaction rate within the stellar temperature range $0.2<T_9<0.7$. Previous direct measurements have reported resonance strengths, but a deeper understanding of the nuclear structure and partial widths of these resonances remains essential. In this work, we revisit the $^{40}Ca(\alpha,3He)^{41}Ca$ reaction at 40 MeV, for which angular distributions and spectroscopic factors have been reported for several known and newly observed states in Sc^{41}, including previously unreported levels at 3.356 MeV and 3.905 MeV excitation energy[1]. By applying a DWBA framework[2] enhanced with experimentally extracted ANCs[3], we aim to determine the proton and neutron partial widths Γ_p for the key resonances in Sc^{41}. Our approach allows consistent comparison of extracted widths with those inferred from gamma-ray resonance data, offering a nuclear structure-based explanation for their astrophysical relevance. This ANC-based method innovatively applies indirect techniques to constrain (p,γ) reaction rates and resonance properties, improving stellar model predictions[4].

Keywords: DWBA analysis, ANC method, resonance widths, mirror transfer reactions.

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Contaminated or Clean? **How Do Surface Conditions Shape Fusion Rates in Deuterated and Boron Targets?**

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We aim to investigate surface effects on p+^{11}Boron and Deuterium+Deuterium fusion reactions in the different metallic environments by combining theoretical and experimental approaches below 20 KeV. In the first phase, SRIM simulations will be used to model deuteron implantation profiles, energy loss, and surface layer formation in metallic targets. Special attention will be given to how oxide or carbon contaminations alter stopping powers and affect fusion yields via electron screening[1,2]. In the second phase, experimental measurements will be performed at the Çekmece Nuclear Research and Training Center using deuterated metal targets under controlled conditions. The study seeks to quantify surface-induced modifications to fusion cross sections and to optimize target preparation for enhanced neutron, proton and alpha productions.

Keywords: D+D reactions, low energy nuclear reactions, surface effect, fusion.

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Fusion in the Deep: Pycnonuclear Reactions Under Extreme Stellar Conditions

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Nuclear reaction rates can increase dramatically by several orders of magnitude, which would be under conditions found in dense and relatively cold astrophysical environments such as white dwarfs, brown dwarfs, and giant planets[1-2]. Similar environments also occur during supernova explosions, where the ignition conditions are essential for cosmological modeling[1,3].

In this study, we introduce a new theoretical framework for calculating nuclear cross sections and reaction rates for light nuclei. This formulation incorporates not only nuclear structure effects but also material dependencies, magnetic field strengths, and the influence of the crystal lattice in dense metallic media[2]. We explore how these factors modify the reaction dynamics and present the impact of our model on both the cross sections and reaction rates[2,4]. This enhanced understanding may provide valuable insights into astrophysical nucleosynthesis and open up new avenues for energy generation using nuclear fusion reactions under solid-state or magnetically enhanced conditions[1,2,4].

Keywords: Reaction rate, astrophysical dense matter, white dwarfs, magnetic field effects.

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Atmospheric Physics and Natural Transport Paths in the Atmosphere

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The Earth's atmosphere can be divided into various layers according to the effects of gravity, density, temperature and pressure changes. The layer that directly concerns living things is the Troposphere, which is between 0-12 km thick.[1] The breathing of living things and photosynthesis events occur in this layer. 99 percent of water vapor and various aerosols, cloud formations are also found in this layer. Natural transport events in the atmosphere occur simply through diffusion, convection and air currents. Air currents are determined by many reasons such as irregular sea and land formations on the Earth's surface, regional temperature differences such as the poles and equator. In addition to air currents, atmospheric rivers and tornadoes are also transport paths. These transport paths, which occur seasonally, are important components of the Earth's climate formation.[2-3] Thanks to these transport paths, water vapor, rain, desert dust, pollen, various viruses and chemical compounds are transported from one region to another on the Earth's surface and form the climate and life on Earth. In recent years, the impact of global warming on these natural air transport pathways in the atmosphere and the transportation of atmospheric pollution caused by industrialization through these pathways have caused great concern. For this reason, scientific studies are being conducted to determine, map and observe changes in the natural air transport pathways in the Earth's atmosphere.

Keywords: Atmospheric physics, atmospheric models, atmospheric river.

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Renormalization Group Studies of Continuous-Spin Complex Systems

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Renormalization group (RG) theory has illuminated critical phenomena across various systems, from discrete-spin models to continuous-spin systems with their distinctive topological transitions. While the XY model in two dimensions established the paradigm of algebraic order through the Berezinskii-Kosterlitz-Thouless transition[1], complex spin systems with multiple degrees of freedom remain less explored. Our study investigates the XY-Ashkin-Teller model, where each site hosts two continuously variable XY spins coupled via two-spin and four-spin interactions. Using position-space RG with bond-moving approximation, we identify a rich phase diagram containing multiple algebraically ordered phases—both ferromagnetic and antiferromagnetic in nature—for both direct and composite spin variables. Notably, these phases correspond to RG fixed surfaces rather than fixed points, characterized by factorizable double Fourier coefficients. This continuous spectrum of critical behavior reveals unprecedented complexity in the universality landscape of continuous-spin systems, providing new frameworks for classifying exotic phases of matter.

Keywords: Renormalization group theory, continuous-spin systems, XY-Ashkin-Teller model, critical phenomena, hierarchical lattices.

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A Holistic Design Approach to Compact Neutron Generators: Adjustable Energies & Enhanced Yield with D-D Fusion Reactions

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Compact neutron generators offer a high-yield, portable neutron source by using D-D reactions without radioactive isotopes or reactors with turn on/off property reducing handling risks. High neutron flux improves precision by speeding up data acquisition and raising SNR in applications like security, medical imaging, and industry[1]. We present a new generator design with three key features: a tunable RF ion source for real-time control of energy and current; an optimized[2] beamline for efficient ion extraction and focusing; and a meshed, metallic deuterated target engineered to enhance electron screening, lowering the Coulomb barrier and boosting reaction rates[3]. Our design improves control over ion-beam transport, and target performance in a compact setup. Simulations show that electron screening significantly enhances D-D fusion. By combining accelerator physics, material science, and nuclear engineering, this design offers a scalable solution for adjustable, high-flux neutron generation, awaiting experimental validation. New calculations shows that new designed generator promise more than 10^8 neutron/s.

Keywords: Compact neutron generator, meshed-material target, RF ion-beam optimization, electron screening enhancement in D-D reaction, computational neutronics.

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Re-thinking the ^{8}Li(α, n)^{11}B Reaction: Evidence for a Missing Resonance in ^{12}B

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The ^{8}Li(α,n)^{11}B reaction is highly interesting in both primordial nucleosynthesis scenarios, particularly in inhomogeneous Big Bang models[1] and in constraining the physical conditions relevant to the r-process[2]. Despite its astrophysical importance, notable discrepancies exist between inclusive and exclusive measurements of the cross section, especially at center-of-mass energies below 3 MeV[3]. To address this issue, we apply the R-matrix formalism for extracting nuclear structure of compound systems such as ^{12}B and for extrapolating the astrophysical S-factor to the relevant Gamow window. In this work, we present R-matrix[4] calculations for the ^{8}Li(α,n)^{11}B reaction, providing results for both the reaction rates and the partial S-factors. By incorporating direct reaction contributions into our model, we are able to reproduce the experimental data from inclusive measurements with improved consistency. We are investigating a possible new resonance in the nuclear structure of ^{12}B, including levels with known energies but uncertain spin-parity that may impact reaction rates. Our extended R-matrix analysis aims to resolve experimental discrepancies and clarify the ^{12}B levels.

Keywords: Big bang nucleosynthesis, inhomegenius big bang model, astrophysical r-process.

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Aktif Matrisli Hibrit Kompozitlerin Piezoelektrik Özellikleri

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Aktif kompozit malzemeler, piropiezo özellikleri sayesinde çoğunlukla radyo mühendisliği, elektronik ve optoelektronik alanlarında kullanılmaktadır. Bu malzemeler; uzay araçlarının radyasyondan korunması, denizaltı görüntüleme, sismik ve jeolojik araştırmalar, alternatif enerji kaynakları ile tıbbi ve biyolojik alanlar gibi uygulamalarda yer almaktadır.[1-2] 0-3 ve 1-3 tipi piezoelektrik kompozitler, farklı boyutlardaki seramik biçimli piezoelektrik parçacıkların (örneğin PZT-5H, PZT-5A) polimer matrisler ile rastgele karıştırılmasıyla elde edilir. Bu aktif matrisli kompozitler özel şekillerde üretilebilir ve piezoelektrik özelliklerini korurlar.[2] Hibrit piezoelektrik kompozitler (HPK), en az iki gruptan oluşan yapılardır. İlk grupta düşük veya yüksek yoğunluklu polimerler (PE—polietilen, PVDF—poliviniliden florür, PP—polipropilen) ile nano boyutlu metal oksitler ($BaTiO_3$, SiO_2, TiO_2) bulunur. İkinci grupta ise yine aynı polimerler ve mikro boyutta tetragonal yapılı PZT (kurşun zirkon titanat) seramikleri yer alır. Birinci gruptaki kompozitler nanokompozit, ikinci gruptakiler ise mikro piezo kompozit olarak adlandırılır. Hibrit piezoelektrik yapı, bu iki grubun entegrasyonu sonucu elde edilir. PZT ailesindeki bileşim çeşitliliğinin piezo-piro ve elektriksel malzemelerin gelişimi için yeterli olmadığı söylenebilir. Bu tür malzemelerde sadece piezo-piroelektrik özellikler değil, aynı zamanda dielektrik sabitleri de artmaktadır. Ancak bu durum malzemenin verimliliğine katkı sağlamamaktadır. Bu nedenle piezo-piroelektrik ve elektroseramik malzemelerin karakteristik verimliliğinde kayda değer bir artış elde edilememektedir. Bu çalışmada, deşarj plazma sistemleri ile elde edilen hibrit piezokompozitlerin ve mikro boyutlu piezokompozitlerin elektromekanik özellikleri araştırılmıştır. Deşarj plazma sistemi ile elde edilen hibrit yapılı piezokompozitler, 5 Hz-40 kHz aralığındaki akustik uygulamalarda kullanılabilir. Uygulama alanlarına özel olarak şekillendirilip farklı kalıplara yerleştirilen hibrit yapılı piezokompozitler, piezo sensörlere dönüştürülebilir.

Anahtar Kelimeler: Hibrit kompozitler, piezokompozitler, deşarj plazma, nanokompozitler.

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Amorf Şerit Üretiminde Kalite Kontrol İçin Vickers Sertlik Ölçümlerinde Standart Sapma Potansiyeli

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Vickers sertlik ölçümleri, amorf malzemelerin mekanik özelliklerini değerlendirmek için temel yöntemlerden biridir. Sertlik ölçümlerinin standart sapması hesaplanarak numuneler arasındaki değişkenlik tespit edilebilir. Düşük bir standart sapma, numunelerin aynı koşullar altında hazırlandığını ve benzer yapısal veya mekanik özelliklere sahip olduğunu gösterir. Amorf malzemelerdeki rastgele ancak düzgün atomik düzen, mekanik özelliklerin birbirine yakın olmasını sağlar[1]. Düşük standart sapma, veri değişkenliğinin minimum olduğunu ve homojenliği doğrular. Özellikle Fe-Si-C amorf malzemelerde, dislokasyonların ve tane sınırlarının olmaması deformasyon ve aşınmaya karşı dayanıklılığı artırır[2].

Bu çalışmada, TQ-150 mikrosertlik cihazı kullanılarak 10 gf yük altında Vickers sertlik ölçümleri gerçekleştirilmiştir. Her numune için ardışık 10 ölçüm yapılmış ve numuneler arasındaki homojenliği değerlendirmek amacıyla ortalama ve standart sapma gibi istatistiksel göstergeler hesaplanmıştır. Düşük standart sapma (≤%1.5) ile, numunelerin yüksek homojenliğini doğrulanmıştır.

Araştırma sonuçları, malzemenin çok yüksek Vickers sertlik değerleri, düşük standart sapma değerleri ve homojen bir yapıya sahip olduğunu göstermiştir. Bu nedenle, düşük standart sapma değerleri, şerit üretiminde süreç istikrarını değerlendirmek için uygulanabilir. Standart sapma, amorf malzemelerde çeşitli mekanik özelliklerin optimize edilmesinde kritik bir rol oynayabilir. Bu yaklaşım, elektrik motorları, transformatörler ve manyetik alanlarda çalışan cihazlarda kaliteyi sürdürmek için değerli olabilir.

Anahtar Kelimeler: Fe-Si-C amorf şerit, kalite kontrol, istatistiksel analiz.

Teşekkür Bölümü: Bu çalışma, Azerbaycan Bilim Fonu'nun (Azərbaycan Elm Fondu) mali desteğiyle gerçekleştirilmiştir. Hibe No: AEF-MQM-QA-2-2023-3(45)-05/01/1-M-01.

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Dielectric Performance and Potential Applications of HDPE/nano MgO Composites

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Metal oxide-filled polymer composites represent a significant advancement in insulation materials, offering enhanced physical properties and novel characteristics. This study investigates the dielectric properties of high-density polyethylene (HDPE) composites with varying concentrations of magnesium oxide (MgO) nanoparticles, focusing on their temperature-dependent and frequency-dependent behavior.[1] Composite samples were prepared by mechanically mixing HDPE with nano-MgO at different volume fractions (0%, 10%, 20%, and 30%), followed by hydraulic pressing at 15 MPa and 130°C for 5 minutes. Dielectric measurements were conducted using a "sandwich"-type measurement chamber and an E7-20 impedance analyser across frequencies of 25 Hz to 1 MHz and temperatures of 297–383 K. Results revealed distinct differences in dielectric constant between pure HDPE and HDPE/nano-MgO composites. The 30% nano-MgO composite exhibited the highest dielectric constant, showing a 45% increase compared to pure HDPE. The loss tangent showed positive correlation with temperature, with a notable conductivity increase at 353 K in the 30% nano-MgO sample. This behavior is attributed to enhanced ionic conductivity, polymer crystalline phase transformation, and increased inter-particle spacing of nano-MgO.[2] The study demonstrates that nano-MgO concentration significantly influences composite dielectric properties, suggesting potential applications in advanced insulation materials and electronic devices.

Keywords: Metal oxide-filled polymer composites, dielectric properties.

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Electrical Conductivity of Low-Dimensional Electron Gas in Asymmetric Quantum Well Scattering in Ionized Impurities in the Absence of Screening

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Currently the development of nanotechnology has made it possible to grow various types of low-size systems, such as thin films, quantum wells and others [1]. Asymmetric quantum wells, unlike symmetric ones, have some very interesting properties. Resistive effects in a semi-parabolic quantum well were studied mainly in phonon scattering, but due to the difficulty of calculating the relaxation time in the case of scattering on impurity ions, they are weakly studied [2-3].

This work is devoted to the study of the electrical conductivity of a two-dimensional electron gas in a semi-parabolic quantum well with scattering of conduction electrons on impurity ions. The work considers a semi-parabolic quantum well with potential $V(z)$ [2].

Calculations show that the electrical conductivity of an electron gas in a semi-parabolic quantum well increases significantly with increasing potential and with decreasing quantum well width. This growth is due to the effect of electron localization and reduced electron scattering. The electron mobility during scattering on impurity ions becomes an order of magnitude greater than during scattering on phonons [2].

Keywords: Electrical conductivity, two-dimensional electron gas, semi-parabolic quantum well.

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Influence of Gamma Radiation on the Anisotropy of Electrical Conductivity in $TlGaTe_2$ Crystals

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The semiconductor crystals $TlGaTe_2$ belong to the class of compounds from group $A^3B^3C_2^6$, crystallizing in the tetragonal space group D_{4h}^{18}. The presence of a gap in the density of states, as well as the highly anisotropic chain-like structure in crystals of this class, suggests the possibility of peculiarities in the mechanism of electrical conductivity[1].

The temperature dependence of the electrical conductivity of the chain-like semiconductor crystal TlGaTe2 was studied along both the chains and perpendicular to them. It was shown that in the region of the activation mechanism of conductivity, the anisotropy coefficient K_σ: it becomes > 1 (a value of K_σ = 1 indicates no anisotropy), increases with temperature, and at 250 K reaches a value of approximately 4, which is higher than the anisotropy coefficient 1/ $K_\sigma \approx$ 3.3 at low temperatures.

This work presents the results of studies on the influence of gamma radiation on the electrical conductivity of $TlGaTe_2$ single crystals.

The experimental results show that induced radiation defects lead to the formation of impurity energy levels in the forbidden band of the crystal. The thermal filling of these levels occurs at a lower temperature compared to the unirradiated compound. This temperature range is also characterized by the thermal filling of trap centers, and localized charged impurities become neutral. Defects of ionization type (charged defects) play a dominant role in these processes, which arise as a result of gamma irradiation. In our opinion, the most likely mechanism for forming radiation defects in $TlGaTe_2$ is the repeated ionization of the anionic sublattice.

Analyzing the obtained data, it can be concluded that gamma irradiation expands the temperature range for the existence of the thermally activated conductivity component. It is also shown that the temperature for the thermal filling of trap centers shifts toward lower temperatures.

Keywords: Semiconductor, radiation, trap center.

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Role of the P_z^{1+} State in Ferromagnetism and Topology of $MnBi_2Te_4$

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$MnBi_2Te_4$ and its layered derivatives exhibit tunable magnetic and topological behaviors, where interlayer spacing[1,2] and $MnBi_2Te_4/Bi_2Te_3$ratios govern antiferromagnetic (AFM) and ferromagnetic (FM) orderings[3,4,5].

This study identifies the P_z^{1+} state as pivotal in driving FM behavior and enabling non-trivial topology. A tight-binding model, as shown in prior studies[6,7], reveals that the M_α/M_β ratio critically controls band inversion and quantum anomalous Hall (QAH) states. At a ratio of 1, band inversion occurs, but even 2-3% deviations yield trivial phases. The P_z^{1+} state enhances spin-dependent band modifications, stabilizing both FM order and topological phases. These results advance strategies for engineering magneto-topological materials for quantum technologies.

Keywords: Ferromagnetism, topological properties, $MnBi_2Te_4$, Tight-Binding Hamiltonian.

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Yapay Zeka Destekli Moleküler Sistemlerin Kuantum Simülasyonu: H_2 Molekülü İçin Qiskit ve OpenFermion ile VQE Uygulaması ve Hata Analizi

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Bu çalışma, yapay zeka tabanlı kuantum algoritmalarının moleküler sistemlerin enerji hesaplamalarındaki potansiyelini araştırıyor. H_2 molekülünün temel enerji seviyesini bulmak için Qiskit ve OpenFermion kütüphanelerini kullanarak Varyasyonel Kuantum Özdeğer Çözücü (VQE) algoritması uygulandı. Farklı optimizasyon yöntemleri olan COBYLA, SLSQP ve SPSA ile simülasyonlar yapıldı ve bu sonuçlar klasik Hartree-Fock yöntemiyle karşılaştırıldı.[1-4] Elde edilen verilere dayanarak hata analizi yapıldı; kuantum simülasyonlarının moleküler kimyada nasıl fayda sağladığı ve kısıtlamaları tartışıldı. Çalışma, kuantum ve yapay zeka teknolojilerinin moleküler modelleme konusundaki önemini vurgulamaktadır.

Anahtar Kelimeler: Kuantum simülasyonu, yapay zeka, VQE, moleküler sistemler, qiskit.

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CHEMISTRY

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Influence of Water Quality on The Electrochemical Behavior of a Carbon Steel Used in The Combustion Chamber of Boilers in a Petroleum Complex

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In this paper, industrial boilers in a petrochemical industry of Skikda (Algeria) are used as the research object. The aim of this work is based on the study of the efficiency of chemical treatments by chemical analysis (pH, TAC), and the study of the influence of these different parameters on the corrosion behavior of C-1026 carbon steel used in combustion chamber tubes in an industrial high pressure boiler[1], using stationary electrochemical methods (free potential: E-t, polarization curves: E-i, the Tafel rights and the R_p). The results obtained, shows that C-1026 carbon steel has good behavior in steam water and feed water. The pH values are clearly basic and almost stable, boiler water TAC values are quite high[2-3]. The treatment of the feed water and the boiler water with inhibitors has reduced the values of the corrosion current density (i_{corr}) and there is a remarkable displacement of the corrosion potential (E_{corr}) to higher values.

Keywords: Carbon steel, corrosion, feed water, boiler water.

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Inhibitive Effect of an Organic Compound on the Corrosion of Carbon Steel in Deminiralized Water

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The study of corrosion inhibition of C-1026 carbon steel in demineralized water by morpholine was carried out using different techniques: stationary electrochemical methods (free potential: E-t, polarization curves: E-i, the Tafel rights and the Rp) and non-stationary electrochemical methods (EIS)[1]. The results obtained show that the addition of morpholine to our medium considerably slows down the corrosion process, this has been confirmed by the noble values of the corrosion potential (E_{corr}) and the low values of the corrosion current (i_{corr})[2].

The immersion time only decreases the inhibitory efficiency. The inhibitory action of our organic compound is related to the formation (by adsorption) of a more or less continuous barrier, but of finite thickness, which prevents access of the solution to the metal. The characterization of the surface was carried out using an optical microscope[3].

Keywords: Carbon steel, demineralized water, corrosion, inhibition.

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Synthesis and Photopolymerization of Imidazole-based Photoinitiator

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Photo curing technology, as an environment-friendly technology, has been widely applied to chemical, machinery, electronics, light industry, communications, and other industries. The most important component of photo curing systems is photoinitiator, which can absorb UV light and therefore generate active species, leading to the photopolymerization of unsaturated monomers or resins. Most research has focused on type 1 initiators that undergo α-cleavage upon excitation and produce two radicals. In type 2 photoinitiators, triplet excited states react with hydrogen donors to form an initiator radical[1] . Imidazoles and their scaffold are an extraordinarily essential class of nitrogen bearing azole heterocyclic compounds. They have different place in wide area of organic synthesis, which can be utilized in a variety of applications in diverse fields including agriculture, medicine, polymer and various industries[2].

In the presented study, imidazole based 2-(1H-imidazol-1-yl)-1-(naphthalen-2-yl) ethan-1-one (IPY) was synthesized and characterized as a new photoinitiator in the light of α-amino acetonaphthone derivatives. The influence of IPY concentration and the addition of the co-initiator N-methyldiethanolamine (MDEA) on methyl methacrylate (MMA) polymerization were also investigated.

Keywords: Photopolymerization, photoinitiator, imidazole.

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Comparative Study of the Performance of Activated Carbon Obtained By Activation and Carbonization of Adsorbent Material Obtained From Avocado Peel with Different Chemicals in Removing Textile Dyes

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Basic Yellow 28 (BY28) is a cationic dye with high water solubility and is one of the persistent pollutants frequently encountered in textile industry wastewater. Due to its cationic nature, it cannot be effectively removed by conventional treatment methods, leading to increased environmental pollution.[1] In this study, the adsorption method was employed for the removal of BY28 from aqueous solutions, utilizing waste avocado peel biomass as a low-cost and sustainable solution.

In addition to raw avocado peels, various types of activated carbon produced by chemical activation and carbonization processes were also used in comparative experiments. The porous structure and high surface area of activated carbon enhance the adsorption efficiency by allowing BY28 molecules to effectively adhere to the surface.[2] Experimental results showed that both raw biomass and chemically activated carbons exhibited varying performances in BY28 removal, with some of them identified as among the most effective adsorbents.

Avocado peels, classified as agricultural waste, are targeted to be used as environmentally friendly adsorbent alternatives. In this context, the study aims to provide sustainable solutions for the treatment of textile wastewater, offering both economic and ecological benefits.

Keywords: Basic Yellow 28, adsorption, activated carbon, textile wastewater, sustainable treatment.

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Treatment of Synthetic Textile Wastewater Containing Both Basic Yellow 28 and Basic Blue 3 Dyes by Electrochemical Method

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Nowadays, the treatment of textile wastewater has become increasingly important due to growing concerns about environmental pollution. Toxic dyes such as Basic Yellow 28 and Basic Blue 3 pose serious risks to ecosystems and human health. This study aims to treat synthetic textile wastewater containing both dyes simultaneously using an electrochemical method. The electrochemical approach offers advantages such as low energy consumption, high efficiency, and sustainability.[1] Using pure aluminum and graphite electrodes, direct current was applied to initiate the treatment. Treatment efficiency was determined via UV-spectrophotometry,[2] while parameters like pH and conductivity were monitored. This study aims to contribute to the literature by simultaneously removing two toxic dyes using an environmentally friendly and innovative technique[3].

Keywords: Basic Yellow 28, Basic Blue 3, electrochemical method, wastewater treatment.

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The Synthesis And Mesomorphic Investigation of New Chiral Calamitic Liquid Crystal Derived From Cyanobiphenyl Core

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Liquid crystals are an intermediate phase between liquid and solid states, exhibiting fluidity like liquids while maintaining a certain degree of order and directed physical properties like solids. Calamitic liquid crystals are the most prominent and extensively studied class of LC[1], and these structures with aromatic ring-based cores and various terminal groups, have a structural stability through molecular interactions ensured by their polar end groups. When chiral units are introduced into the calamitic molecular structure, the resulting chiral liquid crystals exhibit strong optical properties and high sensitivity to environmental stimuli, making them highly suitable for applications in display technologies and sensors[2,3]. In this study, the synthesis of a novel liquid crystal molecule based on cyanobiphenyl core and carrying an (*S*)-2-*n*-dodecyloxypropoxy chiral terminal chain was successfully carried out. The molecular structure was characterized by spectroscopic techniques such as FTIR, ^{1}H-NMR, ^{13}C-NMR and HR-MS. Liquid crystal properties and thermal characteristics were investigated by using polarized optic microscope (POM) and differential scanning calorimeter (DSC). The new molecule exhibited an enantiotropic SmA mesophase (SmA) characterized by a fan-shaped texture in a wide temperature range.

Keywords: Liquid crystals, molecular chirality, (*S*)-2-*n*-dodecyloxypropyl chain.

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One-Step Preparation of Composite Phase Change Films via Photoinitiated Oil-in-Oil Emulsion Templating

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Latent heat storage technology, which offers an important solution for the sustainable use of energy, has been met with increasing interest in recent years and stands out as one of the promising methods in the field of energy storage. In this context, phase change materials (PCMs) are preferred in many thermal energy applications due to their high energy storage properties in a narrow temperature range.[1]

Herein, composite phase change material (PCM) films were prepared via a photo-initiated, oil-in-oil (o/o) emulsion templating approach. SiO_2 nanoparticle loaded o/o emulsions were prepared by dispersing HD in a continuous monomer phase. The amount of nanoparticle loading was varied to investigate the influence of nanoparticles on the film properties and latent heat storage capacity. The latent heat storage capacity of the obtained films was measured via DSC analysis.

Keywords: Phase change material, energy storage, photopolymerization.

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The Preparation and Mesomorphic Investigation of Binary Mixture of a New Chiral Rod-Like Molecule and Benzoic acid Derivative

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Liquid crystals exhibit characteristics between a conventional liquid and a solid crystal. The molecular segments of liquid crystals such as a rigid core, linking groups, terminal groups and lateral substituents play a critical role in determining their phase transition temperatures and thermal stability. Chiral liquid crystals have wide technological applications due to their mesomorphic and electro-optic properties.[1] The role of hydrogen-bonding interactions in the formation and/or stabilization of liquid crystalline phases as well as their stimulus-responsive capability have a significant interest by reserachers.[2] In this study, firstly the synthesis, structural and mesomorphic characterization of a new benzoate based calamitic molecule with an ester linkage group containing (*S*)-2-(dodecyloxy)propyloxy group at one of the end positions and a 6-(hydroxyhexyl)oxy chain at the other end were carried out. The new rod-like molecule was characterized by FTIR, ^{1}H-NMR, ^{13}C-NMR, and HR-MS spectroscopic methods and the obtained mesomorphic data from polarized optic microscope (POM) and differential scanning calorimeter (DSC) showed that it is non-mesogenic. The occurrence of crystal behavior is thought to be due to the increased order due to the effect of intermolecular hydrogen bonds between the hydroxyl groups at terminals. In the second step of the study, an binary mixture of the rod-like molecule with mesogenic 4-(hexyloxy)benzoic acid was prepared in order to restruct the molecular order and investigate the effect of intermolecular hydrogen bonding on inducing the liquid crystal phase. The mixture was characterized FTIR and ^{1}H-NMR, the mesogenic properties were determined by POM and DSC.

Keywords: Liquid crystals, hydrogen bonding, binary mixture.

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Influence of Monomer Composition on the Morphological and Mechanical Properties of Terpene Derivative Macroporous Polymers

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The environmental and economic consequences of dependence on petroleum-based resources have promoted the use of renewable raw materials in polymer industry. In this context, the use of bio-based monomers has emerged as a key research focus in the advancement of sustainable polymer systems[1]. Terpenes, which are among the naturally occurring organic molecules, exhibit chemical reactivity owing to their isoprene-derived structure and abundance of their functional groups. In this regard, d-limonene and β-myrcene, which are belong to terpene familiy, have potential of participating in polymerization reactions, due to the presence of multiple double bonds[1]. Accordingly, terpenes are considered promising monomer candidates for the synthesis of sustainable polymers[2].

Herein, macroporous thermoset polymers were prepared through the crosslinking of high internal phase emulsion (HIPE) templates consisting of β-myrcene and d-limonene in the continuous emulsion phase. To achieve a cross-linked material 1,6-hexanediol diacrylate (1,6-HDDA) was used as crosslinking comonomer. The morphological and mechanical properties of the obtained polymers were investigated in detail depending on the monomer composition. It was revealed that the ratio of d-limonen and β-myrcene in the continuous emulsion phase plays a critical role to obtain highly open-porous polymers. Moreoever, mechanical strength was also found to be varied due to terpene ratio.

Keywords: Terpene, β-myrcene, limonene, macroporous polymer.

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Preparation and Characterization of Alumina Enhanced Kaolinite Supported Capric Acid Based Composite Phase Change Materials

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Phase change materials (PCMs) are chemical substances that are capable of storing thermal energy as latent heat during the melting-crystallization phase change period.[1] PCMs can be used in many areas, which require thermal management depending on their phase transition temperatures and thermal energy storage capacity. In recent years, composite forms of PCMs are preferred instead of their direct use due to the drawbacks of them such as leakage and low heat conduction. [2]

In this study, a capric acid based shape-stabilized composite PCM was prepared and characterized. Capric acid ($CH_3(CH_2)_8COOH$) is a saturated fatty acid, which is one of the promising organic type of PCMs for low-temperature energy storage applications. The composite PCM was prepared with gamma-alumina enhanced kaolinite support matrix by the solvent assisted vacuum impregnation process. The characterization of composite PCM was performed by differential scanning calorimetry (DSC), Fourier transform infrared spectroscopy (FT-IR) and Scanning Electron Microscopy (SEM) analyses. It was anticipated that the composite PCM has a significant potential for low-temperature energy storage applications with thanks to its melting temperature as 31.0 °C and melting enthalpy as 53.4 J/g.

Keywords: Phase change material, capric acid, thermal energy storage.

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Synthesis of TX-Based Photoinitiator with Antibacterial Activity

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Photopolymerization is an important industrial process that is frequently used in many fields such as inks, coatings, adhesives, contact lenses, biomaterials, etc. due to its various advantages. The most important component of the photopolymerization process is the photoinitiator, which initiates polymerization by absorbing light. Photoinitiators are classified as type I, type II and one component type II depending on the initiation mechanism. Type II photoinitiator require the use of lower energy light sources than type I photoinitiators as they exhibit absorption properties at longer wavelengths and this behavior reduces the cost of the processes. Thioxanthone (TX) and its derivatives are examples of type II photoinitiators. They are interesting in photochemistry because they have high photoinitiation efficiency and absorb most strongly in the 380-420 nm UV-Visible range. In recent years, a lot of research has been done to synthesize photoinitiators operating in the visible region on the spectrum. This is because cheap and safe for health[1]. The use of nitrogen-containing heterocyclic compounds is important for the development of clinically bioactive compounds. The pyrazole ring is one of these heterocyclic compounds it exhibit a wide range of pharmacological effects. The prevention of bacterial buildup on biomedical materials depends on the surface properties of the materials. It is very important develop antibacterial coatings to prevent bacteria from spreading. Combining antibacterial polymers and coatings has been shown to be an effective way to fight bacterial pathogens[2].

The aim of the study focuses on the synthesis and characterization of thioxanthone-based photoinitator with antibacterial activity.

Keywords: Photoinitiator, thioxanthone, pyrazole, antibacterial.

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Assessment of the Impact of Climate Change Projects on the Sustainable Development of the Country Based on Multi-Criterion Analysis Method

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The Republic of Azerbaijan joined international efforts to mitigate the negative impacts of global climate change by ratifying the UN Framework Convention on Climate Change in 1995, the Kyoto Protocol to the Convention in 2000, and the Paris Agreement in 2016. Azerbaijan, with a population of approximately 10 million, accounts for only 0.15% of global greenhouse gas emissions[1].

Azerbaijan is determined to become a leading country in the field of renewable energy and is using its rich wind and solar potential to this end. It is also a crucial component of the country's plan to reduce greenhouse gas emissions by 40% by 2050[2]. It is necessary to develop projects to reduce greenhouse gas emissions in Azerbaijan in the following areas: energy, industry, agriculture, land use and forestry, and waste management are priority sectors. The assessment of the project's impact on Sustainable Development is carried out according to the following 4 criteria: social criteria, economic criteria, environmental criteria and influencing policy in relevant areas[3,4]. The assessment is made using numbers between -1 and +1, taking into account positive and negative effects. Calculations should be made based on the corresponding impact values, with score values ranging between -1 and +1 for each project under consideration. The calculations should be continued in accordance with the National Criteria system and concluded with a result indicating the impact of the Project under consideration on the Sustainable Development of the Country. If the result obtained is positive, the Project under consideration has a positive impact on the Sustainable Development of the Country and can be implemented as a Clean Development Mechanism project.

Keywords: Greenhouse gas emissions, renewable energy, industry, sustainable development.

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Improving Flame Resistance and Polymer Compatibility of Ethylene Propylene-Diene Rubber (SKEPT-60) Through Polyvinyl (PVX) Modification

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This study aims to enhance the flame resistance and compatibility of ethylene-propylene-diene rubber (SKEPT-60) with other polymers by modifying it with polyvinyl (PVX) at different ratios. SKEPT-60, an unsaturated copolymer with high ozone and temperature resistance (Mooney viscosity: 60 Pa·s, dicyclopentadiene content:1.8%), exhibits poor flammability resistance and limited polymer compatibility. To address these drawbacks, SKEPT-60 was mechanically blended with PVX at 40–50°C for 3–4 minutes, forming binary (SKEPT-60/PVX) systems.

The rheological properties of these blends were investigated under varying loads (11.75, 20.85, 26.10, 32.60 kg) and temperatures[1,2]. Results indicated that the optimal PVX content for improved performance was 2–4 phr (parts per hundred rubber)[3]. Further validation involved preparing filled composite materials based on SKEPT-60/PVX blends, which were vulcanized at 155°C for 25 minutes. The modified composites exhibited significant enhancements in flame resistance, polymer compatibility, tensile strength, metal adhesion, tear resistance, fatigue durability, and aging coefficients compared to unmodified SKEPT-60.

Keywords: Ethylene-propylene-diene rubber (EPDM), polyvinyl modification, flame resistance, polymer compatibility, rheological properties.

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Synthesis of Reagents Based On Natural Oil Acids and Ethylenediamine and Their Study As Components For Preservation Fluids

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Atmospheric corrosion remains a critical issue in countries with advanced oil and gas industries, particularly exacerbated by growing anthropogenic pollution[1]. One of the effective preventive strategies is the use of conservation fluids with corrosion-inhibitive components. In this study, reagents based on natural petroleum acids (NPAs) and ethylenediamine were synthesized, including amidoamine derivatives and their complexes with transition metal salts (Mn, Fe, Zn, Ni). These reagents were incorporated into T-46 oil distillate both individually and as composite mixtures to formulate protective conservation fluids[2].

The synthesized conservation fluids were evaluated under accelerated corrosion conditions in humidity chambers, marine water, and 0.001% sulfuric acid solution. The corrosion resistance period of steel-3 samples ranged up to 308 days, depending on the composition and concentration of the additive[3]. Notably, the complex of amidoamine with the iron salt of NPAs demonstrated the longest protective effect (up to 270 days in humidity chambers), while also offering superior performance in marine and acidic environments. Given the economic advantage and availability of iron salts compared to other metal counterparts, this composition is considered a promising candidate for practical applications in atmospheric corrosion protection.

Keywords: Corrosion inhibitors, amidoamine, ethylenediamine, natural petroleum acids, conservation fluids.

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Chitosan-Tannin Based Flocculant for Heavy Metal (Ni^{2+}, Cu^{2+}, and Zn^{2+}) Removal from Industrial Wastewater: Investigating the Influence of pH, Reaction Time, and Stirring Speed

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The removal of heavy metal ions from wastewater is a great importance for environmental cleanliness and human health. Wastewater discharged from various sources, such as industry, agriculture, and municipalities, contains a large amount of organic and inorganic pollutants, which causes serious consequences for the ecosystem as a whole[1]. There is a growing need for a treatment method that is not only effective but also eco-friendly and cost-efficient. While natural coagulants have been widely researched for water treatment, the potential of chitosan modified with tannins as a natural coagulant is still not fully explored. This study investigates the removal of Cu^{2+}, Zn^{2+}, and Ni^{2+} from industrial wastewater using a chitosan-based composite flocculant derived from tannins extracted from pomegranate peel. The study looks into various factors that influence the removal process, such as solution pH, adsorbent dosage, initial metal concentration, temperature, and contact time, and discusses how each of these factors affects the performance of the flocculant. Tannins were extracted by drying and grinding pomegranate peels into an 80-mesh powder, followed by Soxhlet extraction using 80% methanol[2]. Their presence was confirmed through a colorimetric ferric chloride test. Chitosan and tannins were combined under controlled conditions, followed by crosslinking with glutaraldehyde. The resulting composite was filtered, washed, and dried. The material demonstrated potential for heavy metal removal, offering a sustainable approach to wastewater treatment. Synthesis of bioflocculant significantly improved key water parameters, including pH and turbidity. The removal efficiencies achieved were up to 90% for Cu^{2+}, 75% for Zn^{2+}, and 70% for Ni^{2+}. The addition of the flocculant, along with proper pH adjustment, has improved the efficiency of the metal removal processes. pH was identified as a critical variable, with specific optimum values determined for different metals. Compared to traditional methods such as chemical precipitation and conventional coagulationflocculation processes, the pomegranate peel-chitosan flocculant offers advantages due to its natural origin, ease of production, and simplified pH adjustment requirements.

Keywords: Chitosan, tannin, bioflocculant, heavy metal removal, wastewater treatment.

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Intelligent Identification of Multicomponent Mixture Components Using an Artificial Intelligence

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This article presents an advanced method for the qualitative and quantitative identification of components in multicomponent mixtures using two densitometers and artificial intelligence (AI). The proposed approach eliminates dependence on chromatographic operating conditions by incorporating a standardized dual-detector system and a mathematical model for determining molecular mass. The core equations are enhanced through regression analysis and neural network techniques, enabling automated and high-precision identification without manual calibration.

The article introduces ChromAI ID Pro, a dedicated software platform that integrates signal acquisition, real-time analysis, AI-based predictions, visualizations, and report generation. The system utilizes machine learning algorithms such as Random Forest and MLPRegressor to predict molecular weights based on detector signals and known standard parameters. Comparative simulations demonstrate a significant reduction in prediction error and improved reliability under variable conditions.

Experimental data and illustrative examples, including model accuracy comparisons and graphical outputs, are provided to validate the efficiency of the method. The proposed solution is applicable to industrial and laboratory settings where fast, accurate component identification is essential.

Keywords: Gas chromatography, densitometer, regression analysis, neural network, artificial intelligence, molecular mass prediction, ChromAI ID Pro.

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Investigation of Concentration Liquids Formulated by Incorporating Amidoamine and Various Fatty Acids into T-30 Oil Distillate

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Atmospheric corrosion refers to the gradual degradation of metals and other materials due to the interaction with atmospheric elements through chemical or electrochemical mechanisms. It is one of the most prevalent forms of corrosion, primarily influenced by environmental factors such as humidity, oxygen, carbon dioxide, and airborne salt particles[1-3]. To mitigate this issue, the application of preservation fluids and lubricants offers a more cost-effective and practical solution. In the current study, corrosion tests were conducted in accordance with GOST 9054-75 standards within a “Q-4” thermo-humidity chamber, utilizing seawater and a 0.001% amidoamine-based preservation fluid derived from vegetable fatty acids. The results aim to evaluate the effectiveness of these preservation fluids in preventing atmospheric corrosion under controlled conditions.

Amidoamine compositions synthesized from cottonseed and sunflower fatty acids in a 1:1 molar ratio were prepared, followed by the formulation of preservation fluids through the addition of T-30 oil distillate. Based on the conducted tests, it can be concluded that the corrosion protection efficacy of the preservation fluids, formulated with amidoamine and organic acids, is superior to that of the T-30 oil distillate used as a solvent, across all three tested environments on metal substrates.

The corrosion protection effectiveness of preservation fluids prepared by adding 10% and 20% of these inhibitors to T-30 oil distillate on metal plates was observed to be 310 and 326 days, respectively, in the "G-4" thermo-humidity chamber, 142 and 145 days in seawater, and 139 and 142 days in a 0.001% H_2SO_4 solution.

Keywords: Amidoamine, fatty acid, hydrochamber, corrosion protection.

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Nitration Behavior of Aromatic- and Olefin-Enriched Coking Light Fraction with Ionic Catalytic Systems

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The direct nitration of the light fraction of coking distillates — composed of aromatic, olefinic, and aliphatic hydrocarbons — presents significant technological challenges due to the similar boiling points of its constituents and the high, non-selective reactivity of olefins. In this study, a coking light fraction, previously characterized via sulfolane extraction to contain approximately 32% aromatics and olefins, was subjected to nitration without prior fractionation or separation. The reactions were carried out using 59% nitric acid in the presence of catalytic systems comprising sodium nitrite ($NaNO_2$), N-methylpyrrolidone (NMP), and imidazolium-based ionic liquids[1,2]. By varying the reaction temperature and catalyst combinations, product yields ranging from 54% to 66% were achieved. IR and NMR analyses confirmed that nitration occurred predominantly on aromatic structures, with minimal formation of O-NO_2 groups and oxidative by-products. The enhanced selectivity and non-volatile nature of the ionic liquids simplified product separation, contributing to a more efficient and energy-saving process. These findings demonstrate that ionic liquid-based nitration offers an effective and scalable strategy for the direct functionalization of petroleum fractions rich in aromatics and olefins, eliminating the need for prior separation steps[3].

Keywords: Coking fraction, aromatic nitration, Ionic liquids, selective catalysis, green nitration.

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Phosphoryl-Substituted α-Chloro- and α-Thiocyanatoacetaldehydes in the Reaction with α-Pyridone

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In the reactions of phosphorylated α-chloro- and α-thiocyanatoacetaldehydes with α-pyridone, two classes of heterocyclic compounds, 2-phosphoryl-oxazolo[2,3-a]pyridinium chlorides and 4-pyridyl-substituted 2-oxothiazolidines, were synthesized. These compounds feature a rare combination of phosphoryl, oxazolyl, and thiazolidine groups, making them promising for potential biological activity and coordination chemistry applications[1,2]. The product structures were confirmed by NMR spectroscopy, which revealed characteristic coupling constants and chemical shifts. The study highlights α-pyridone as a versatile nucleophile in constructing C-phosphorylated heterocycles with potential functional applications[3].

Keywords: Phosphoryl aldehydes, α-Pyridone, oxazolo compounds, heterocycles.

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BIOLOGY

YTÜ FEN EDEBİYAT FAKÜLTESİ YTÜ FACULTY of ARTS and SCIENCES
TURAN-FUNDAMENTAL SCIENCES SYMPOSIUM
TURAN-TEMEL BİLİMLER SEMPOZYUMU
Honorary Chair/Onursal Başkan: Prof. Dr. Aziz SANCAR

Analysis of Codon Usage Bias of Chloroplast Genomes in *Camellia* Species

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Camellia species are significant ornamental shrubs and flowering trees, valued for their economic importance in various sectors, including medicine, food, and beverages.[1] The chloroplast genome is commonly utilized in chloroplast gene expression, studies of species evolution, and genetic transformation within the chloroplast.[2] Codon usage bias (CUB), which describes the non-random preference for certain synonymous codons over others, provides valuable insights into gene function, species evolution, and foreign gene expression.[3] Although CUB in chloroplast genomes of *Camellia* species has not been extensively studied, this research systematically analyzed the chloroplast genomes of three *Camellia* species (*C. sinensis*, *C. nitidissima*, and *C. ptilophylla*) to investigate the factors influencing CUB patterns. Our findings demonstrated that the chloroplast genomes of the three *Camellia* species exhibit a strong bias toward AT-rich sequences and a preference for codons ending in A or T. Across these species, 17 high-frequency codons were consistently identified, along with 10 to 19 optimal codons. The ENC-plot, PR2-plot, neutrality plot, and correspondence analysis collectively indicated that CUB in the three *Camellia* species is shaped by both natural selection and mutation pressure, with natural selection playing a more prominent role. Comparison of codon usage frequencies with those of four common model organisms revealed that *Nicotiana tabacum* and *Saccharomyces cerevisiae* are suitable candidates for heterologous gene expression. Collectively, this study elucidated the patterns of synonymous codon usage in *Camellia* species, offering important insights that could facilitate future genetic engineering efforts in these plants.

Keywords: *Camellia* species, codon usage bias, chloroplast genome, natural selection.

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ABSTRACTS OF ACCEPTED POSTERS NOT PRESENTED AT THE SYMPOSIUM

MATHEMATICS

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Honorary Chair/Onursal Başkan: Prof. Dr. Aziz SANCAR

Mathematical Methods in Machine Translation: From Statistics to Neural Networks

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Machine translation is one of the key tasks in the field of natural language processing (NLP), actively developing thanks to advances in mathematics and computer science. Most modern automatic translation systems are based on rigorous mathematical models that allow formalizing linguistic patterns, taking into account contexts, and training models on large volumes of text.

In the early stages of development, statistical methods were used, such as alignment-based models and probabilistic frameworks, including hidden Markov models and Bayesian networks. These methods made it possible to take into account the frequencies of words and phrases, estimate the probability of translation, and use optimization algorithms to select the best option[1].

With the development of deep learning and the growth of computing power, statistical models were replaced by neural models based on recurrent neural networks (RNN), and then on transformers. Architectures such as Seq2Seq[2] and Transformer have made it possible to model the dependency between words in the context of the entire sentence. They actively use such mathematical concepts as vector representations, matrix operations, attention mechanisms[3], and gradient descent.

Thus, mathematical methods — be it probabilistic modeling, linear algebra, optimization, or information theory — form the foundation of machine translation and continue to play a key role in creating more accurate and "human-like" translation systems.

Keywords: Machine translation, neural models, mathematical models.

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Modeling of Compaction in Hermetic Joint Systems of Mining Equipment and Evaluation of Vibrational Effects on Them

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The article considers the assessment of the vibration effect of the wellhead equipment compaction system. It is shown that the theoretical and experimental development of the issue of compaction, which has a dynamic effect on the loading of geometric norms of elasticity-hysteresis properties, has not been reflected in very few studies. For this purpose, the effect of the geometric coefficient form of the compactor on its dynamic properties has been studied. The regularities obtained during the study of the effect of the geometric properties of rubbers with different compositions have been considered. It has been determined that the form of the surface strength of the compacting element subjected to compression should be selected mainly taking into account the stability requirements of the structure.

Keywords: Rubber packers, dynamic loading regime, impact loading, forced vibrations.

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[1] Aliev V. I., Hasanov İ. İ. (2023). *Improving the Sealing Efficiency of Compressor Cylinders of Gas Engine Compressors in the System of Gas-Lift Production of Offshore Fields.* Journal of Machinery Manufacture and Reliability, 52(6), 630–634. doi: 10.1134/S1052618823060043.

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PHYSICS

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Bozons Scattering in Higgs Sector

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The fundamental particles couplings to the Higgs particles are set by their masses. This new type of interaction is very weak for light particles (e.g., u and d quarks, and electrons), but strong for heavy particles (e.g., Z - and W -gauge bosons and t -quarks). That is, the SM Higgs boson couplings to fundamental fermions are linearly proportional to the fermion masses, whereas the couplings to gauge bosons and as well as the Higgs boson self coupling are proportional to the square of the gauge boson masses and square of the Higgs boson masses. It is of methodological interest to study theoretically the processes of scattering of the vector bosons with exchanging of the Higgs bosons and decay of Higgs boson into two massive bosons. In our model, the ladder Bethe-Salpeter equation for amplitude *A* of the of Z (or W)-bosons scattering with an infinite exchange by the virtual Higgs bosons has the form[1] $A(p,p';k,k') = V^2\Delta(p,p') + \left(V^2/(2\pi)^4\right)\int d^4q\Delta(q)\Delta(p-q)\Delta(k-q)A(q,p';k,k')$.

Here p, p' and k, k' are initial and final 4-momenta of bosons, V - the three-linear bosons vertexes. Δ is the bosons propagators. In the Regge regions of high energy changes, asymptotic solutions of the corresponding equations for the imaginary part of scattering amplitudes in the form of power functions are found[2].

Keywords: Spontaneous symmetry breaking, Higgs particles, nonperturbative approximation, Bethe-Salpeter equation.

References

[1] Gadjiev S. A., Jafarov R. G. (1986). *On the Regge Asymptotics of the Scattering Amplitude of Scalar Particles at Arbitrary Angles.* Bull. Lebedev Phys. Inst., 11, 25-28.

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CHEMISTRY

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Removal of Basic Blue 3 Dyestuff by Adsorption Method with Tilia Vulgaris Leaves

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Dyes in industrial wastewater can pose serious threats to the environment due to their low biodegradability and toxic properties[1]. These dyes have high solubility in water and have a negative impact on photosynthesis and human health in aquatic ecosystems due to their toxic effects[2]. Therefore, it is important to remove these harmful compounds from wastewater before they are released into the environment. Adsorption is an emerging technique as an alternative to traditional methods for the removal of colours from water by combining chemical and biological processes[3]. In this study, the removal of textile dyes from wastewater was investigated with the help of a low-cost, environmentally friendly and widely available alternative adsorbent. In this study, the target textile dye was Basic Blue 3 and Tilia Vulgaris tree leaves were used as adsorbent.

Keywords: Basic blue 3, tilia vulgaris tree leaves, adsorption, wastewater treatment.

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TURAN-Fundamental Sciences Symposium

(TURAN25) Oral Presentations

June 23, 2025 – MONDAY

08.30-10.00	**REGISTRATION**	
10.00-12.00	**OPENING SPEECHES** ***Prof. Dr. Salim YÜCE***, Chair of the Symposium, Dean of the Faculty of Arts and Sciences, Yıldız Technical University ***Prof. Dr. Misir MARDANOV***, Azerbaycan Cumhuriyeti Bilim ve Eğitim Bakanlığı Matematik ve Mekanik Enstitüsü Müdürü ***Prof. Dr. Eyüp DEBİK***, Rector, Yıldız Technical University ***Prof. Dr. Aziz SANCAR***, Honorary Chair of the Symposium	
12.00-13.30	**LUNCH**	
13.30-14.15	**INVITED PLENARY TALK 1:** *Prof. Dr. İbrahim Halil KAVAKLI*, Can We Target the Core Clock Mechanism for the Treatment of Different Diseases?, Chair: *M. Kasım ŞENER*	
14.15-14.45	**INVITED TALK:** *Kemal Yavuz ATAMAN*, Maveraünnehir, Horasan, Harezm Havzasında Muhtelif İlimlerin Birlikte Gelişmesi, Meşhur Alimlerin Yetişmesi, Kıymetli Eserlerin Yazılması Üzerine Bir Analiz, Chair: *Senem ÖNER BULUT*	
14.45-15.00	**Coffee and Tea Break**	
	HALL 1, Session 2, Mathematics, Chair: *Fatma KARACA*	**HALL 2, Session 2, Mathematics,** Chair: *Aysel TURGUT VANLI*
15.00-15.15	*Zehra İŞBİLİR*, 2-Parameter Generalized Quaternions with Generalized Tribonacci Numbers Components	*Suzan IŞIK*, Improved Fixed Point Approximations via Picard's Three-Step Iteration for Suzuki-Type Non-Expansive Mappings
15.15-15.30	*Edanur ERGÜL ARSLAN*, Calculus on Real-variable Split Quaternion-valued Functions	*İpek Ebru KARAÇAY*, Investigation of Fractal Dimension Algorithms in Different Geometries
15.30-15.45	*Pelin DURSUN*, Characteristic Roots, Eigenvalues and Eigenvectors of a Certain Type of 4×4 Dual Tridiagonal Matrices	*Radva ANSARY*, Machine Learning-Based Classification of Chaotic Behavior In Discrete Dynamical Systems
	HALL 3, Session 2, Mathematics, Chair: *Seda KIZILBUDAK ÇALIŞKAN*	**HALL 4, Session 2, Physics,** Chair: *Banu Süngü MISIRLIOĞLU*
15.00-15.15	*Deniz GÜNDOĞAN*, Modelling Electromagnetic Wave	*İsmet İŞGÖR*, Electrodeposition and Spray Techniques for Pt/Pd Coated Nickel Foam Electrodes
15.15-15.30	*Handan ÇELİK*, Numerical Modeling of Stars and Mathematical Analysis	*Fatih PİLAVCI*, Körük Ventili (Levelling Valve) Hava Akış Karakteristiklerinin Karşılaştırmalı Teknik İncelemesi
15.30-15.45	*Abdüllatif YALÇIN*, New Midpoint and Trapezoid-Type Inequalities for Co-ordinated m-Convex Functions via Variable-Order Fractional Calculus	*Serdar DİZMAN,* Sinop İlinde Nükleer Güç Santrali Öncesi Kabalı Nehrinin Sularında Trityum Radyoaktivitesinin Araştırılması
14.45-15.00	**Coffee and Tea Break**	

	HALL 1, Session 3, Mathematics, Chair: *Fatma KARACA*	**HALL 2, Session 3, Mathematics**, Chair: *Aysel TURGUT VANLI*
16.00-16.15	*Sema Nur ÇEPE*, Comparative Analysis of Türkiye's Road Traffic Accidents Using Data Mining Techniques	*Dilara KARSLIOĞLU*, Variation of parameters and Hölder stability of differential
16.15-16.30	*Kübra ÇETİNBERK*, The Moment of Inertia of Generated Curves: A Holditch-Type Theorem	*Gamze ALKAYA*, W5-Curvature Tensor on a Complex Contact Space Form
16.30-16.45	*Merve ÇOLAK*, Do Oil Prices Have a Chaotic Effect on Unemployment and Inflation	*Yonca SEZER*, Schauder Estimates for Elliptic Operators in Banach-Sobolev Spaces
16.45-17.00	*Nisa ÇELİK,* Genel DSW Sistemine Genişletilmiş Jacobi Eliptik Fonksiyon Yaklaşımı: Tam Çözümler, Kararlılık ve Simülasyonlar	*Ömer DURAN*, Identities on the generalized harmonic numbers of rank with order using generating functions
	HALL 3, Session 3, Mathematics, Chair: *Neslihan ÖZDEMİR*	**HALL 4, Session 3, Mathematics,** Chair: *Mustafa DÜLDÜL*
16.00-16.15	*Çiğdem Zeynep YILMAZ*, A Study on Dual Quaternions with k-Pell and k-Pell-Lucas Coefficients	*Hamide Feyza AYKUT*, Hyperbolic Functions on Split Quaternions and Their Characteristics
16.15-16.30	*Duygu ÇAĞLAR ÇAY*, A Study on Vietoris' Hybrinomials	*Sevilay ÇORUH ŞENOCAK*, Surface Pencil With Constant Gaussian Curvature Along A Non-null Curve
16.30-16.45	*Emel KARACA*, On multiplicative magnetic flux ruled surfaces	*Damla BUDAK*, Rectifying Rose Ruled Surfaces
16.45-17.00	*Gülsüm Yeliz SAÇLI*, A Study on the Dual Quaternionic Sequence with Vietoris' Components	*Zehra Nur BAKIRBAŞ*, The Cross products on Dual and Dual Lorentzian Spaces
17.00-18.00	**POSTER**	
18.30	**DINNER**	

June 24, 2025 – TUESDAY

10.00-10.45	**INVITED PLENARY TALK 2:** *Prof. Dr. Bilal BİLALOV*, Some Questions of X-valued Elliptic Equations, Chair: Misir MERDANOV	
10.45-11.15	**INVITED TALK:** *Dr. Amir MOSAVİ*, A Decade of Machine Learning Research: Evaluation Metrics, Taxonomies and Bibliometrics Analysis, Chair: Yonca SEZER	
11.15-11.30	**Coffee and Tea Break**	
	HALL 1, Session 1, Mathematics, Chair: *Neslihan ÖZDEMİR*	**HALL 2, Session 1, Mathematics,** Chair: *Fatma KARACA*
11.30-11.45	*Betül ÖZTÜRK*, Bazı Antiviral Moleküllerin Topolojik Karakterizasyonu	*Günay ASLAN,* Solitary Wave Solutions of the Two-Dimensional Fractional-Order Nonlinear Schrödinger Equation
11.45-12.00	*Emine KOPARAL*, Affine Factorable Surfaces in Euclidean 4-Space E4	*Elman İBRAGIMOV*, Boundedness criteria for the G-fractional integral and G-fractional maximal operator on Gegenbauer-morrey spaces
12.00-12.15	*Beyza SARUHAN*, Monge Surfaces With Their Applications	*Bedriye Ecem AKGÜÇ CIMBIZ*, Hemen Hemen Neo Kobalans Sayıları

	HALL 3, Session 1, Chemistry, Chair: *Göknur YAŞA ATMACA*	**HALL 4, Session 1, Biology,** Chair: *Burgu Gündüz ERGÜN*
11.30-11.45	*Nargiz RAHIMLI*, Particle Size Analysis of Polymer-Based Metal Nanoparticles Using DLS Method	*Deniz Duru DERVİŞ*, Potential Use of Watermelon Seed Oil as an Alternative Linoleic Acid Source Enhanced by Coffee-Derived Caffeic Acid in Cholesterol Treatment
11.45-12.00	*Elmira ALIYEVA*, The Study of The Swelling Ratio of Gum Arabic and Acrylamide Hydrogel in Solutions with Different Ph	*Meliha Feryal SARIKAYA*, Bazı Yonca (Medicago sativa L.) Genotiplerinin iPBS-retrotranspozon Markörleri ile Genetik Çeşitliliğin Değerlendirmesi
12.00-12.15	*Akbota KUANDYKOVA*, Synthesis, structure, and properties of new alicyclic and aromatic amidophosphates	*Narmin GULIYEVA*, γ (Gama) Işınlarıyla Muamelenin Bitkilerde Tuz (NaCl) Stresine Tepkisi
12.30-13.30	**LUNCH**	
13.30-14.15	**INVITED PLENARY TALK 3:** Prof. Dr. Salim ÇERÇİ, CERN Today: Pushing the Boundaries of Particle Physics, Chair: *Zeynep GÜVEN ÖZDEMİR*	
14.15-14.45	**INVITED TALK:** Prof. Dr. Farman MAMEDOV, On the L1data Dirichlet Problem for the Nonuniform Parabolic Equations of Second Order, Chair: *Misir MERDANOV*	
14.45-15.00	**Coffee and Tea Break**	
	HALL 1, Session 2, Mathematics, Chair: Serkan ÇAKMAK	**HALL 2, Session 2, Mathematics,** Chair: Yaprak DERİCİOĞLU
15.00-15.15	*Abdurrahman DAYIOĞLU,* Bazı Özel Afin Yapıların ve Duallerinin Kromatik İndislerinin Bulunması Üzerine	*Sariya ALLAHVERDIYEVA*, On Solvability an Inverse Value Problem for the Boussinesq-Love Equation with Nonlocal Integral Conditions
15.15-15.30	*Neslihan ÖZDEMİR*, Optical bullets for the (3+1)-Dimensional Perturbed Nonlinear Schrödinger Equation having the Cubic-Quintic Laws and the Spatio-Temporal Dispersion	*Muhammet KNEFATI,* Δ-Convergence For Proximal Point Algorithm And Fixed Point Problem in Generalized CAT(0) Spaces
15.30-15.45	*Basri ÇELİK*, TBMM Maarif Vekâletinin 1920 yılında aldığı geometri öğretimi kararları üzerine	*Rumella JAFAROVA,* Mathematical Modeling of Investment Risks in the Construction Sector Using Fuzzy Logic
	HALL 3, Session 2, Chemistry, Chair: *Özlem YAZICI*	**HALL 4, Session 2, Physics,** Chair: *Macide CANTÜRK*
15.00-15.15	*Rana KHANKISHIYEVA*, Development of Lead-Free Epoxy Resin Composites for X-Ray Shielding	*Ainur SERIKBAIKYZY*, Surface Engineering of Ti13Nb13Zr Implants Using Microarc Oxidation and Hydroxyapatite-Based Thermal Spraying
15.15-15.30	*Tuğrulhan DEMİR*, Alunit Cevherinin RSM Kullanılarak Liçinin Optimizasyonu	*Zoltan FODOR*, A New Force in Nature? The Magnetic Moment of the Muon
15.30-15.45	*Günel AZİMOVA*, Synthesis of Green Chemistry-Based Catalyst for Carbon Monoxide Neutralization	*Rakhshana MAMISHOVA*, Dielectric Properties Of $CuTlS_2$ Crystals Studied Via Impedance Spectroscopy
15.45-16.00	**Coffee and Tea Break**	

	HALL 1, Session 3, Mathematics, Chair: *Basri ÇELİK*	**HALL 2, Session 3, Mathematics,** Chair: *Neslihan ÖZDEMİR*
16.00-16.15	*Hande USLU TUNA*, Competitive Systems via Hamiltonian Framework and Artificial Neural Estimation	*Nail TUKTAMYSHOV*, Impulse-Hydrodynamic Model of Explosive Impact on a Half-Plane with Circular Cavity
16.15-16.30	*Yaprak DERİCİOĞLU*, Data-Driven Estimation of Krylov Iterations in Riccati Solvers	*Abdusobir SAIDOV,* Model And Theorem Of Exıstence Of The Problem Of Optımal Control Of The Customs Clearance Process
16.30-16.45	*Serkan ÇAKMAK,* q-Türev Kullanılarak Tanımlanan Yeni Bir Harmonik Fonksiyon Sınıfının Geometrik Özellikleri	*Narmina GUBATOVA,* Necessary conditions for weak and strong local minimum the problem of the calculus of variations with higher order derivatives
16.45-17.00	*Fatma KARACA,* Some Characterizations of Gradient Ricci-Yamabe Solitons	*Djamal HAMADI,* Numerical Analysis of Stiffened Shell Structures Using an Efficient Three-Dimensional Finite Element
17.00-17.15	*Burcu ALTINTAŞ,* Matematik Lisans Öğrencilerinin Seçmeli Ders Seçimlerinin Oyun Teorisi İle Matematiksel Modellenmesi	*Shahin GULIYEV,* Development of a General Algorithm for Solving Stability Problems of Plates on Elastic Bases
	HALL 3, Session 3, Chair: *Misir MERDANOV*	**HALL 4, Session 3, Physics,** Chair: *Altan BOZDOĞAN*
	Adil ABDULLAYEV, Dielectric Relaxation and Conductivity Characteristics of Gamma-Irradiated TlGaTe2 and TlInSe2 Crystals	*Aydan KKHALIGZADE*, Effect of Doping and Radiation on the Conductivity Mechanism in Layered GaS Crystals
	Aida TAGIYEVA, On an Algorithm for a Morphological Analyzer of the Azerbaijani Language	Amina MIKAYILOVA, Prospects of Thermal Waters Usage in Small Power Industry
	Surkay AKBAROV, The Influence of the Interaction with Fluids of the Hollow Cylinder with Inhomogeneous Initial Stresses on the ZGV Modes that Occur with Axisymmetric Wave Propagation	*Sümeyye BÜYÜKKAZAZ,* (E)-2-(2,4-dihidroksibenziliden) tiyosemikarbazon ve (E)-2-[(1H-indol-3-il) metilen] tiyosemikarbazon komplekslerinin yapısal ve spektroskopik özelliklerinin DFT metoduyla incelenmesi
		Zarina ARINGOZHINA, Optimization of Ion-Plasma Nitriding Parameters for Ti-6Al-4V Titanium Alloy
	Baharchin AKHMADLI, On the strong solvability of a nonlocal boundary value problem for the Laplace equation in weighted grand Sobolev spaces in rectangle	*İpek BALNAN*, Enhancement of Visible-Light-Driven Photocatalytic Activity in Gd-Doped CdZnS Nanocomposites
17.15-18.00	**POSTER**	
18.30	**DINNER**	
June 25, 2025 – WEDNESDAY		
10.00-11.30	**BILATERAL COOPERATION PANEL**	
11.30-12.30	**LUNCH**	
12.30	**EXCURSION (17.00 BOAT)**	
20.00	**DINNER**	

TURAN-Fundamental Sciences Symposium (TURAN25)

Poster Presentations

Name Surname	Section	Presentation Name	
Kübra AYSU	Physics	Electron Screening Meets Space: D+D Fusion-Driven Propulsion Systems	JUNE 23, MONDAY
Burak ÖZCAN	Physics	Constraining Key Resonances in the 40Ca(p,γ)41Sc Reaction via ANC-Assisted DWBA Analysis of Transfer Reactions and its Astrophysical Reaction Rate	
Derin ÇIVGIN	Physics	Contaminated or Clean? How Do Surface Conditions Shape Fusion Rates in Deuterated and Boron Targets?	
Doğukan BARLAS	Physics	Fusion in the Deep: Pycnonuclear Reactions Under Extreme Stellar Conditions	
Elif Seda ÇAĞATAY	Physics	Atmospheric Physics and Natural Transport Paths in the Atmosphere	
Erbil Can ARTUN	Physics	Renormalization Group Studies of Continuous-Spin Complex Systems	
Hasret Gül ÖZTOP	Physics	A Holistic Design Approach to Compact Neutron Generators: Adjustable Energies & Enhanced Yield with D-D Fusion Reactions	
Yasemin BULAT	Physics	Re-thinking the ^{8}Li(α, n)^{11}B Reaction: Evidence for a Missing Resonance in ^{12}B	
Rana CABRAYILOVA	Physics	Aktif Matrisli Hibrit Kompozitlerin Piezoelektrik Özellikleri	
Nadia HAMMOUDA	Chemistry	Influence of Water Quality on The Electrochemical Behavior of a Carbon Steel Used in The Combustion Chamber of Boilers in a Petroleum	
Nadia HAMMOUDA	Chemistry	Inhibitive Effect of an Organic Compound on the Corrosion of Carbon Steel in Demineralized Water	
Alper OĞUZ	Chemistry	Synthesis and Photopolymerization of Imidazole-based Photoinitiator	
Beyza MORALI	Chemistry	Removal of Basic Blue 3 Dyestuff by Adsorption Method with Tilia Vulgaris Leaves	
Halide İrem KOÇ	Chemistry	Treatment of Synthetic Textile Wastewater Containing Both Basic Yellow 28 and Basic Blue 3 Dyes by Electrochemical Method	
İnci Tuğba ÖRDEKBAY	Chemistry	The Synthesis And Mesomorphic Investigation of New Chiral Calamitic Liquid Crystal Derived From Cyanobiphenyl Core	
Meltem SÖZBİR	Chemistry	One-Step Preparation of Composite Phase Change Films via Photoinitiated Oil-in-Oil Emulsion Templating	
Nazlı Özgü KIRAL	Chemistry	The Preparation and Mesomorphic Investigation of Binary Mixture of a New Chiral Rod-Like Molecule and Benzoic acid Derivative	
Rümeysa BEYAZ	Chemistry	Influence of Monomer Composition on the Morphological and Mechanical Properties of Terpene Derivative Macroporous Polymers	
Semanur SAĞLAM	Chemistry	Preparation and Characterization of Alumina Enhanced Kaolinite Supported Capric Acid Based Composite Phase Change Materials	
Eylem YAŞAR	Mathematics	Ağırlıklı Standart Olmayan Banach Uzaylarında Harmonik Fonksiyonların Yapısal Analizi	
Yeşim Aktürk DİZMAN	Biology	Analysis of Codon Usage Bias of Chloroplast Genomes in Camellia Species	

Tebriz SHAMILOV	Physics	Amorf Şerit Üretiminde Kalite Kontrol İçin Vickers Sertlik Ölçümlerinde Standart Sapma Potansiyeli	JUNE 24, TUESDAY
Rauf JAFAROV	Physics	Bozons Scattering in Higgs Sector	
Aida AZIZOVA	Physics	Dielectric Performance and Potential Applications of HDPE/nano MgO Composites	
Huseynov HUSEYNAGHA	Physics	Electrical Conductivity of Low-Dimensional Electron Gas in Asymmetric Quantum Well Scattering in Ionized Impurities in the Absence of Screening	
Dilara GAFAROVA	Physics	Influence of Gamma Radiation on the Anisotropy of Electrical Conductivity in TlGaTe2 Crystals	
Elbek KESKİNOĞLU	Physics	Role of the Pz1+ State in Ferromagnetism and Topology of MnBi2Te4	
Büşra ŞAHİNAL	Physics	Yapay Zeka Destekli Moleküler Sistemlerin Kuantum Simülasyonu: H_2 Molekülü İçin Qiskit ve OpenFermion ile VQE Uygulaması ve Hata Analizi	
Şuheda Nur KOCATEPE	Chemistry	Synthesis of TX-Based Photoinitiator with Antibacterial Activity	
Sanam VALIYEVA	Chemistry	Assessment Of The Impact Of Clımate Change Projects On The Sustaınable Development Of The Country Based On Multı-Crıterıon Analysıs	
Aynur MAMMADOVA	Chemistry	Improving Flame Resistance and Polymer Compatibility of Ethylene-Propylene-Diene Rubber (SKEPT-60) Through Polyvinyl (PVX) Modification	
Ulviyye ABBASOVA	Chemistry	Synthesis Of Reagents Based On Natural Oil Acids And Ethylenediamine And Their Study As Components For Preservatıon Fluids	
Sara HASANOVA	Chemistry	Chitosan-Tannin Based Flocculant for Heavy Metal (Ni2+, Cu2+, and Zn2+) Removal from Industrial Wastewater: Investigating the Influence of pH, Reaction Time, and Stirring Speed	
Arzu İBRAHIMOVA	Chemistry	Intelligent Identification of Multicomponent Mixture Components Using an Artificial Intelligence	
Rufana ALIZADE	Chemistry	Investigation of Concentration Liquids Formulated by Incorporating Amidoamine and Various Fatty Acids into T-30 Oil Distillate	
Sara ABBASZADE	Chemistry	Nitration Behavior of Aromatic- and Olefin-Enriched Coking Light Fraction	
Sevda ASADOVA	Chemistry	Phosphoryl-Substituted α-Chloro- and α-Thiocyanatoacetaldehydes in the Reaction with α-Pyridone	
Buazhar KOCHKKONBAEVA	Mathematics	Mathematical Methods in Machine Translation: From Statistics to Neural Networks	
Seda KIZILBUDAK ÇALIŞKAN	Mathematics	Exact Solutions of The Time Fractional Benney-Luke	
Tuba SATILMIŞ	Mathematics	Lipschitz Stability Analysis of Nonlinear Set-Valued Differential Equations with Initial Time Differences	
Ümit ILDIZ	Mathematics	Orlicz-Sobolev Uzaylarında Yerel Olmayan Bir Problemin Güçlü Çözülebilirliği	
Parvin GULIYEVA	Mathematics	Ülke İçinde Karayolu ile Yük Taşımacılığı	
Farhad MAMMADOV	Mathematics	Fe-Si-C Amorf Şerit Numunelerinin Araştırılması ve Kristal Fe-Si Muadilleri ile Karşılaştırılması	
Siavash AZİMİ	Mathematics	Basicity of a Trigonometric System in Morrey-type Spaces	
Ilman HASANOV	Mathematics	Modeling of compaction in hermetic joint systems of mining equipment and evaluation of vibrational effects on them	

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