

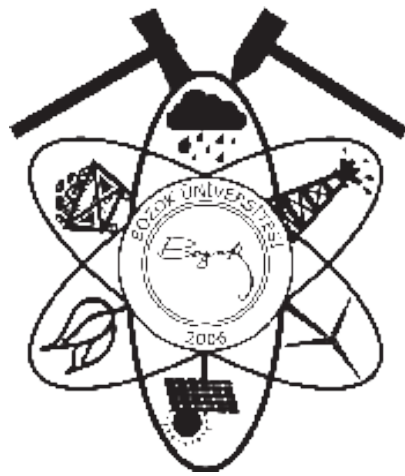


BOZOK UNIVERSITY 1st INTERNATIONAL UNDERGROUND RESOURCES AND ENERGY CONFERENCE

6-8 OCTOBER
2016



ORAN Orta Anadolu
Kalkınma Ajansı
Middle Anatolia Development Agency



Bozok University
1st INTERNATIONAL
UNDERGROUND
RESOURCES AND
ENERGY
CONFERENCE
6-8 October 2016

Table of Contents

INVITED SPEAKERS

Investigation of Photonuclear Reaction Products from Gallium Target	1
<i>AKKOYUN S. and BAYRAM T.</i>	
Nuclear MOX Fuel Burnup Analysis and Monitoring Using Non-Destructive Method	2
<i>AKYUREK T. and USMAN S.</i>	
The So-Called Oslo Method: Simultaneous Extraction of Nuclear Level Density and Gamma-Ray Strength Function	3
<i>ALGIN E., AY K. O., OZGUR M., GUTTORMSEN M.</i>	
Electrical Characterization and Sources of Energy Losses in Solar Cells	4
<i>ALTINDAL Ş. and ÇETİNKAYA H. G.</i>	
Prospection, the Role of the Geological Engineers in the Mine Prospecting and National Mining Policy	5
<i>ARIK F.</i>	
Factors Affecting the Quality of Groundwater Resources and Its Effects in Turkey	7
<i>BABA A.</i>	
Underground Thermal Energy for Sustainable Development: Available Methods for Seasonal Solar Thermal Energy Storage	8
<i>BASER T., MC CARTNEY J.S.</i>	
Investigating the P-T-X Conditions of Hydrothermal Fluid Flow responsible for Au-Ag-Base-Metal Mineralization in the Biga Peninsula	9
<i>BOZKAYA G.</i>	
Clay Occurrences Related to Hydrothermal Ore Deposits: Indicator for Condition, Origin and Age	10
<i>BOZKAYA Ö.</i>	
The Effect of the Deformation Parameter on the Cross Sections for $^{110}\text{Pd}(d,n)^{111}\text{Ag}$ and $^{110}\text{Pd}(d,2n)^{110}\text{Ag}$ Reactions	11
<i>BÖYÜKATA M., SARPÜN I.H., AYDIN A.</i>	
Evaluation of Relation of Delice River and Aquifer Systems Based on Groundwater Quality in the Vicinity of Yerköy (Yozgat)	12
<i>ÇELİK M.</i>	
New Trends in the Photovoltaic Technology	13
<i>ERKOVAN M., BULAT S.</i>	
Role and Importance of the Magnesite Ore	14
<i>EROL M.Ş.</i>	
Possible Nuclear Power Plant Types for Turkey in the Future, Nuclear Energy and Technology Policies.	15
<i>ERTÜRK S.</i>	
The Late Mesozoic-Cenozoic Magmatism and Related Mineralizations in North-Eastern Turkey	16
<i>EYÜBOĞLU. Y</i>	
Mineral Resources Potantial in Yozgat Province	17
<i>GÖKCE A.</i>	
Sustainable Development and Geology	18
<i>GÜNGÖR Y.</i>	
Shallow Geothermal Systems and Their Feasibility in Turkey	19
<i>KADIOĞLU Y.K.</i>	

The Solutions of Neutron Transport Equation: Theory and Applications	20
<i>KAŞKAŞ A.</i>	
Variation of Trace and Radioactive Elements in Oil Shales: A case study on Hatıldağ and Çayırhan Oil shales	21
<i>KOÇ Ş., YAVUZ PEHLİVANLI B., SARI A.</i>	
Piezoelectrics as Micro-Energy Devices	22
<i>KURT E.</i>	
Static and Dynamic Effect in Halo Nuclei Interactions	23
<i>KÜÇÜK Y.</i>	
Geothermal Energy Storage in Unsaturated Soils	24
<i>MC CARTNEY J.S. and BAŞER T.</i>	
Dating Studies at Ankara University	25
<i>MERİÇ N.</i>	
Oil Shale Rock as an Alternative Energy Raw Material Used For Oil/Energy Production, Ongoing Projects and Potential of Turkey	26
<i>MURAT. A</i>	
On the Effectiveness of the Brink Hypothesis for Stellar B-Decay And Electron Capture Rates	28
<i>NABI J.U, Calvin JOHNSON C.</i>	
The Investigation of Vermiculite and Boron Admixtures as an Alternating Shielding Material for Gamma Rays	29
<i>GULBİÇİM H., TÜRKAN N.</i>	
Source Rock Studies of the Bituminous Shales (Oil Rocks) in Sorgun (YOZGAT) Field: From the Field of Oil and Gas in Economic Quantities Can Be Produced?	30
<i>SARI A., MURAT A., UĞUR F.A., EKİNCİ M.K</i>	
Development and the Importance of Afyonkarahisar in Geothermal Future	31
<i>ULUTÜRK Y.</i>	
LWR Design Impact on Radiological Source Term	32
<i>USMAN S., AKYUREK, T.</i>	
Accelerator Technologies, CERN and Turkish Accelerator Center	33
<i>YAVAŞ Ö.</i>	
 ORAL PRESENTATIONS	
The Origin of Eylence Yayla Pb-Zn-Cu±Au Mineralization (Kelkit-Gumushane, NE Turkey)	35
<i>AKBULUT K, AKARYALI E.</i>	
Geothermal Resources of Yozgat Province and Their Characteristics	36
<i>AKIN G.</i>	
Significance of Geotechnical Investigations during the Mining of Underground Resources	37
<i>AKIN M, AKIN M.K</i>	
Mars, in Term of Relations Between Undergroud Treasures and Cosmos	38
<i>AKIZ H. F.</i>	
Different Methods for Dead-time Determination of Nuclear Detectors	39
<i>AKYUREK T.</i>	
Geochemical Investigations and Ore Potential of the Volcanites in SW Konya	40
<i>ARIK F., AY B., ÖZEN Y.</i>	
Yesterday to Future - Temrezli Uranium Project	41
<i>AYDIN N.</i>	

Numerical Analysis of Operating Performance of A Plate Type Heat Exchanger Used in Geothermal Applications	42
<i>AYDIN, K., URAL, T., KEÇEBAŞ, A.</i>	
On the Binding Energy Predictions of RMF Model with DEFNE Interaction Parameters	43
<i>BAYRAM T., AKKOYUN</i>	
Density Functional Study of Spin Multiplicity and Molecular Interaction Site Effect on Stability of COALB_n Clusters For n=1-7	44
<i>BÖYÜKATA M., POLAT İ.</i>	
Investigation of Hydrogeological Properties of Denizli Basin Geothermal System (Southwestern Anatolia, Turkey)	45
<i>BÜLBÜL A., ALÇİÇEK H., ALÇİÇEK M.C., YAVUZER İ.</i>	
Investigation of Morphological and Mechanical Properties of Fe-%40Ni-%2X (X=Mn, Si) Alloys	46
<i>BÜYÜKAKKAŞ S.</i>	
Reaction Cross-Section Calculations of the Structural Reactor Materials ^{58,60,61,62,64}Ni for Different Level Density Models	47
<i>ÇAPALI V., ŞEKERCİ M., ÖZDOĞAN H., KAPLAN A.</i>	
Characterizations of Ion Permeability in NavMs Channel	48
<i>ÇAVUŞ M., KÖRPE E., ACAR A.O., KUYUCAK S., BAŞTUĞ T.</i>	
Microscopical Optical Model Analysis of 10Be+64Zn Elastic Scattering System: Effectiveness of Form of Density Distribution	49
<i>DİREKÇİ M., BALDIK R., BOZTOSUN İ.</i>	
Quantum Fisher Information Dynamics for LMG Model Under Decoherence	50
<i>DURAN D.</i>	
Extended Studies for Strontium Isotopes: Energy Levels and Half-lives	51
<i>DULGER F., SERT Y., BOZTOSUN I.</i>	
Fabrication and Characterization of (Bi_{1-x-y}Er_xYb_y)₂O₃ System for Solid Oxide Fuel Cells	52
<i>ERMİŞ İ.</i>	
Energy Dependence and Nuclear Energy Projects in Turkey	53
<i>FURUNCU Y.</i>	
Common Underground Treasures of Anatolian Civilizations in the 2nd Millennium BS	54
<i>KAHRAMAN ÇİNAR A., ŞİMŞEK F.</i>	
Second Law Analysis of an Adsorption Air-Conditioning System	55
<i>KARA O., HÜRDOĞAN E., BÜYÜKALACA O.</i>	
Producing Gas From Coal and Using in Energy	56
<i>KOCAMAN R.1, BOZTAŞ S.C.2, KOCAMAN B.1</i>	
Biomarker Characteristics of Low Organic Carbon Coal: Yatağan Coal Occurrences (Denizli/SW Turkey)	57
<i>KORALAY D.B.</i>	
Using Measure Corralate Predict Methods to Calculate Wind Energy Potential, and an Utilization in Karabuk	58
<i>KÖSE B., GÜNEŞER M.T., RECEBLİ Z.</i>	
Investigation of Gold Deposits Related to Alteration with Radiometric Method: Arzular (Gümüşhane) Area	59
<i>MADEN N., AKARYALI E.</i>	

Determination of the Genesis of Eocene Volcanics in the Borçka (Artvin, Ne Türkiye) Area with Gamma Ray Spectrometer	60
<i>MADEN N., AKARYALI E., Emre AYDINÇAKIR E.</i>	
Stable Isotope Studies ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) on W-Skarn Mineralization Associated with Topuk Pluton (Bursa, Western Anatolia, Turkey)	61
<i>ORHAN A., MUTLU H.</i>	
The Thermal Examination of Fibreglasses Application for Heat Recovery Tanks	62
<i>ÖZDEMİR M., ÖKTEN K.</i>	
New Type Gels for Dye Sensitized Solar Cells	63
<i>ÖNEN T., ÖZBAY KARAKUŞ M., COŞKUN R., EREN YAKIŞIKLIER M., ÇETİN H.</i>	
Energy Security in the Power Axis and Reflections on the Stability	64
<i>ÖZALP M.</i>	
Dyes Extracted from Pelargonium Flowers: A Solar Cell Application and Dyes Ingredients Analysis Study	65
<i>ÖZBAY KARAKUŞ M., KOCA İ., KOCA A., ER O., ÇETİN H.</i>	
Numerical Modeling of Large Scale Ground Coupled Heat Exchanger, Performance Evaluation and Sustainability	66
<i>OZDOGAN-DOLCEK A., TINJUM J.M.</i>	
Geochemical, Fluid Inclusion and Isotopic (S, O, Pb) Investigations of Pınarbaşı Pb-Zn Mineralization (Gediz-KÜTAHYA) NW Turkey	67
<i>ÖZEN Y. and ARIK F.</i>	
Genetic Relationship of Polymetallic Hydrothermal Değirmenciler Sb, İnkaya Cu-Pb-Zn-(Ag) and Arpaçukuru Fe-Cu Mineralizations in Simav (Kütahya-Nw Turkey)	68
<i>ÖZEN Y. and ARIK F.</i>	
Numerical Solution of the Neutron Transport Equation Using SN Method with the First Kind of Chebyshev Polynomials	69
<i>ÖZTÜRK H.</i>	
The Experimental and Theoretical Spectroscopic Characterization of 3-[(N-methylanilino) methyl]-5-(thiophen-2-yl)-1,3,4-oxadiazole-2(3H)-thione	70
<i>ÖZTÜRK N., ALAŞALVAR C., EL-EMAM A.A.</i>	
Explanation of M1 Excitations Via Spin-Spin Interaction in odd-Mass $^{229-233}\text{Th}$ Isotopes	71
<i>TABAR E., YAKUT H.1, QULIYEV H., KULIEV A.A.</i>	
Global Optical Potential for the Elastic Scattering of $^{17}\text{O}+^{58}\text{Ni}$	72
<i>SERT Y.</i>	
Sustainability Assessment of Renewable Energy Sources for Electricity Production in Turkey Using Analytic Network Process (ANP) with Benefits, Opportunities, Costs and Risks (BOCR) Analysis	73
<i>ŞAHİN U.</i>	
Comparison of Sustainability Assessment of Fossil Fuels for Electricity Production in Turkey Using Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP)	74
<i>ŞAHİN U.</i>	
Some Magnetic Properties of Metallic Glasses as Perfect Raw Materials for Applications	75
<i>ŞAHİNGÖZ R.1, KANBUR ÇAVUŞ H.1</i>	

Enhanced Some Physical Properties of CuO Films by Changing Annealing Atmosphere	76
<i>TAŞKÖPRÜ T., GENÇYILMAZ O.</i>	
Mineralogy and Geochemistry of the Iron Mineralizations Associated with Uckapili Granitoid (Nigde)	77
<i>TUMUKLU A., ALTUNCU S. and OZGUR F. Z.</i>	
XPS Analysis of Cd Diffusion into Cu-poor and Cu-rich Cu(In,Ga)Se₂ Solar Cell Absorbers	78
<i>ÜMSÜR B., CALVET W., BERCEGOL A., STEIGERT A., KISS J., MIRHOSSEINI H., GORGOI M., GREINER D., KAUFMANN C.A., LUX-STEINER M.CH. and LAUERMANN I.</i>	
Trace Elements of Sulfide Minerals in Dursunbey (Balıkesir-) Pb-Zn Ore Deposit	79
<i>ÜNAL ÇAKIR. E.</i>	
Application of Sulfur and Carbon Isotopes for Geochemical Investigation of Oil Shale: A Case Study from the Çeltek Formation, Sorgun, Yozgat (Turkey)	80
<i>YAVUZ PEHLIVANLI B.</i>	
Synthesis, Structural and Electronic Characterization of 2-Carboxy-4-Hydroxyanilinium Chloride Hydrate	81
<i>YILDIRIM M.H., ODABAŞOĞLU M.</i>	
POSTER PRESENTATIONS	
Deciphering the Conditions Resulted in the Deposition of Hançili Formation's Organic-Rich Shale: Anoxia or High Sedimentation Rate?	83
<i>AKKAYA P., MORADİ A.V., SARI A.</i>	
Interlayer Thickness Dependent Electrical Characteristics of Al/ (3% Zn-Doped Al/Pva) /P-Si (Mps) Structures at Room Temperature	84
<i>BADALI Y., NIKRAVAN A., BILGEN BENLİ B., ALTINDAL Ş., USLU İ.</i>	
Integration of Kızılay Mineral Spring and Afyon Gazlıgöl Geothermal System	85
<i>BÜLBÜL A., KOÇ A.C.</i>	
Effect of Alloying Elements on Mechanical Properties of Fe-based SuperAlloys	86
<i>BÜYÜKAKKAŞ S.</i>	
Investigation of Hydrothermal Alteration by ASTER SWIR Satellite Images (Ağmaşat Plato, Zara-SİVAS)	87
<i>CANBAZ O., GÜRSOY Ö. and GÖKCE A.</i>	
A Study on Elastic Scattering of ¹⁹F + ¹⁵⁹Tb Reaction	88
<i>ÇİÇEK Ş., AYGUN M., AYGUN Z.</i>	
An Theoretical Analysis of Quasi-elastic Scattering of ⁷Li + ¹²⁰Sn System	89
<i>ÇİÇEK Ş., AYGUN M., AYGUN Z.</i>	
Microscopic Optical Model Analysis of ⁷Be+ ⁵⁸Ni Elastic Scattering System at E_{Lab}= 23.2 MeV	90
<i>DİREKÇİ M., BOZTOSUN İ.</i>	
Coal Petrography analysis of Ç and SJ no of samples that belongs to New Çeltek Coal Companies	91
<i>EKİNCİ Z.D. , YAVUZ PEHLİVANLI B.</i>	
Geometry Optimization, Spectroscopic Characterization and Nonlinear Optical Properties of Dimethylammonium 4-Nitrobenzoate: A DFT Study	92
<i>ESMER K., AVCI D., TAMER Ö., ATALAY Y.</i>	
Electrical Analysis of Polymer Thin Films: Comparison Study	93
<i>ŞAHİNGÖZ R., KANBUR ÇAVUŞ H.</i>	
Effects of Mean Free Path Parameters for Reaction Cross-Section Calculations	94
<i>KAPLAN A., ÇAPALI V., ŞEKERCİ M., ÖZDOĞAN H.</i>	

Investigations of Self Excited Oscillations Along Perforated Plates Which Have Different Hole Diameters	95
<i>OZALP C. ve KARA O.</i>	
Factors Controlling Element Composition Variations and Organic Matter Accumulation of Tekirler Organic-Rich Rocks (Ankara/Turkey)	96
<i>KOCA D., SARI A.</i>	
The Natural Radiation Level and its possible effect on Human Health: Gümüşhane Example	97
<i>MADEN N., ÇELİK N., AKARYALI E.</i>	
Cross-Section Calculations of (γ,xn) and (p,xn) Reactions for ^{197}Au	98
<i>ÖZDOĞAN H., ŞEKERCİ M., ÇAPALI V., KAPLAN A.</i>	
Stable Isotope Investigation of Gürkuyu Sb Mineralization (Gediz-Kütahya-Nw Turkey)	99
<i>ÖZEN Y., ARIK E.</i>	
Depositional Environment According to Rare Earth Elements (REE) content of Hañçili Formation Interbedded Oil Shale and Coal in Dodurga Basin (Çorum- TURKIYE)	100
<i>SARI A., YAVUZ PEHLİVANLI B.</i>	
Production Cross-Section of Medical ^{177}Lu Using Neutron and Proton Induced Reactions	101
<i>ŞEKERCİ M., ÇAPALI V., ÖZDOĞAN H., KAPLAN A.</i>	

Honorary President

Prof. Dr. Salih KARACABEY

Bozok University Rector

Conference Coordinators

Assist. Prof. Dr. Yusuf SERT

Assist. Prof. Dr. Berna YAVUZ PEHLİVANLI

Assist. Prof. Dr. Esra ÜNAL ÇAKIR

Bozok University

Bozok University

Bozok University

Organizing Committee

Prof. Dr. Hikmet ŞELLİ AYBAR

Prof. Dr. Recep ŞAHİNGÖZ

Prof. Dr. Hidayet ÇETİN

Prof. Dr. Mustafa BÖYÜKATA

Assoc. Prof. Dr. Mustafa ERKOVAN

Assoc. Prof. Dr. Hatice KANBUR ÇAVUŞ

Assist. Prof. Dr. Yusuf SERT

Assist. Prof. Dr. Berna YAVUZ PEHLİVANLI

Assist. Prof. Dr. Esra ÜNAL ÇAKIR

Assist. Prof. Dr. M. Avni AKÇE

Res. Assit. Dr. Mikail DİREKÇİ

Lecturer Esra GÜNGÖR ULUTAŞ

Res. Assit. Hasan ULUTAŞ

Middle Anatolia Development Agency

Bozok University

Bozok University

Bozok University

Bozok University

Sakarya University

Bozok University

Bozok University

Bozok University

Bozok University

Bozok University

Bozok University

Bozok University

Bozok University

Scientific Committee

Prof. Dr. Ahmet GÖKÇE

Prof. Dr. Ahmet SAĞIROĞLU

Prof. Dr. Ahmet ŞAŞMAZ

Prof. Dr. Ali SARI

Prof. Dr. Alper BABA

Prof. Dr. Cemal BÖLÜCEK

Prof. Dr. Gülcan BOZKAYA

Prof. Dr. Halim MUTLU

Prof. Dr. Mehmet ALTUNSOY

Prof. Dr. Mehmet ÇELİK

Prof. Dr. Mehmet Sezai KIRIKOĞLU

Prof. Dr. Muharrem SATIR

Prof. Dr. Mustafa KUŞÇU

Prof. Dr. Necati TÜYSÜZ

Cumhuriyet University

Fırat University

Fırat University

Ankara University

İzmir Institute Of Technology

Balıkesir University

Pamukkale University

Ankara University

Akdeniz University

Ankara University

İstanbul Technical University

Tübingen University, Germany

Süleyman Demirel University

Karadeniz Technical University

Prof. Dr. Ömer BOZKAYA	Pamukkale University
Prof. Dr. Sadettin KORKMAZ	Karadeniz Technical University
Prof. Dr. Şakir ŞİMŞEK	Hacettepe University
Prof. Dr. Şükrü KOÇ	Ankara University
Prof. Dr. Taner ÜNLÜ	Ankara University
Prof. Dr. Yener EYÜBOĞLU	Karadeniz Technical University
Prof. Dr. Yusuf Kağan KADIOĞLU	Ankara University
Prof. Dr. Yüksel ÖRGÜN	İstanbul Technical University
Assoc. Prof. Dr. Demet Banu KORALAY	Pamukkale University
Assoc. Prof. Dr. Emin ÇİFTÇİ	İstanbul Technical University
Assoc. Prof. Dr. Fetullah ARIK	Selçuk University
Assoc. Prof. Dr. Hasan ÇELİK	Fırat University
Assoc. Prof. Dr. Leyla KALENDER	Fırat University
Assist. Prof. Dr. Ayşe ORHAN	Nevşehir Hacı Bektaş Veli University
Assist. Prof. Dr. Derya KOCA	Batman University
Assist. Prof. Dr. Erkan YILMAZER	Aksaray University
Assist. Prof. Dr. Sinan ALTUNCU	Niğde University
Assist. Prof. Dr. Sonay BOYRAZ ARSLAN	Aksaray University
Assist. Prof. Dr. Yıldırım GÜNGÖR	İstanbul University
Dr. Abdurrahman MURAT	Türkiye Kömür İşletmeleri(TKİ)
Ahmad ARSLAN KWR	Watercycle Research Institute,Netherlands
Losif VOLFSON KTH	Royal Institute Of Technology,Swedish
Tuğçe BAŞER	University Of California San Diego,USA
Assoc. Prof. Dr. John S. McCartney	University of California San Diego,USA
Alexander Richter	Marketing & Communications Director at
Green Energy Geothermal Ltd. and Founder	& Principal at ThinkGeoEnergy
Prof. Dr. Jesus Lubian RIOS	Inst. De Fisica,Brazil
Prof. Dr. Jameel-Un NABI	Ghulam Ishaq Khan Institute,Pakistan
Prof. Dr. Michael FINDLATER	University Of Texas Tech,USA
Prof. Dr. Gamal A. EL-HITI	King Saud University,Saudi Arabia
Prof. Dr. İsmail BOZTOSUN	Akdeniz University
Prof. Dr. Fatih UCUN	Süleyman Demirel University
Prof. Dr. Bülent GÖNÜL	Gaziantep University
Prof. Dr. İhsan ULUER	Karabük University
Prof. Dr. Sefa ERTÜRK	Niğde University
Prof. Dr. Kadir ESMER	Marmara University
Prof. Dr. Erol KURT	Gazi University
Prof. Dr. Lütfi ÖKSÜZ	Süleyman Demirel University
Prof. Dr. Mahmut DOĞRU	Bitlis Eren University
Prof. Dr. Mehmet ERTUĞRUL	Atatürk University

Prof. Dr. Osman YILMAZ	METU
Prof. Dr. Emel ALĞIN	Eskişehir Osmangazi University
Prof. Dr. M. Atıf ÇETİNER	Kastamonu University
Prof. Dr. Sümer ŞAHİN	Atılım University
Prof. Dr. Üner ÇOLAK	İstanbul Technical University
Prof. Dr. Hidayet ÇETİN	Bozok University
Prof. Dr. Hikmet Şelli AYBAR	Bozok University
Prof. Dr. Nizamettin ERDURAN	İstanbul Zaim University
Prof. Dr. Pervin AKTUNA ARIKAN	Gazi University
Prof. Dr. Recep ŞAHİNGÖZ	Bozok University
Prof. Dr. Ali Ercan EKİNCİ	Erzincan University
Prof. Dr. Ahmet Hakan YILMAZ	Karadeniz Technical University
Prof. Dr. Suat ÖZKORUCUKLU	İstanbul University
Prof. Dr. Nuri ÖZEK	Süleyman Demirel University
Prof. Dr. Ayşe KAŞKAŞ	Ankara University
Prof. Dr. Mustafa BÖYÜKATA	Bozok University
Prof. Dr. Ömer YAVAŞ	Ankara University
Prof. Dr. Niyazi MERİÇ	Ankara University
Prof. Dr. Turgay KARALI	Ege University
Prof. Dr. Ayşe GÜNEŞ TANIR	Gazi University
Prof. Dr. Mehmet N. KUMRU	Ege University
Prof. Dr. Saleh SULTANSOY	TOBB University of Eco.&Technology
Assoc. Prof. Dr. Nurdan DEMİRCİ SANKIR	TOBB University of Eco.&Technology
Assoc. Prof. Dr. Serkan AKKOYUN	Cumhuriyet University
Assoc. Prof. Dr. Abdullah KAPLAN	Süleyman Demirel University
Assoc. Prof. Dr. Asım SOYLU	Niğde University
Assoc. Prof. Dr. Orhan BAYRAK	Akdeniz University
Assoc. Prof. Dr. Çağrı ÇIRAK	Erzincan University
Assoc. Prof. Dr. Gökhan KOÇAK	Erciyes University
Assoc. Prof. Dr. Erol KAM	Yıldız Technical University
Assoc. Prof. Dr. Şule ERGÜN	Hacettepe University
Assoc. Prof. Dr. Ayhan KARA	Sinop University
Assoc. Prof. Dr. Tuncay BAYRAM	Sinop University
Assoc. Prof. Dr. Mahmut BÖYÜKATA	Kırıkkale University
Assoc. Prof. Dr. Murat AYGÜN	Bitlis Eren University
Assoc. Prof. Dr. Ümüt TEMİZER	Bozok University
Assoc. Prof. Dr. Sait YILMAZ	Bozok University
Assoc. Prof. Dr. Yasemin KÜÇÜK	Akdeniz University
Assoc. Prof. Dr. Nurettin TÜRKAN	Medeniyet University
Assist. Prof. Dr. Mevlüt ARSLAN	Bozok University

Assist. Prof. Dr. Murat ÇAVUŞ	Bozok University
Assist. Prof. Dr. Hatice KANBUR ÇAVUŞ	Bozok University
Assist. Prof. Dr. Mesut KARAKOÇ	Akdeniz University
Assist. Prof. Dr. Selva BÜYÜKAKKAŞ	Niğde University
Assist. Prof. Dr. Halil GÖKÇE	Giresun University
Assist. Prof. Dr. Nuri ÖZTÜRK	Giresun University
Assist. Prof. Dr. Muharrem KIRAK	Bozok University
Assist. Prof. Dr. Atila Abir İĞÇİ	Bozok University
Assist. Prof. Dr. Mehmet DOĞAN	Bozok University
PHD Asım A. BALAKİT	Babylon University, Iraq
Dr. İbrahim DİNÇER	University Of Ontario
Dr. Tayfun AKYÜREK	Marmara University
Dr. Andrea VİTTURİ	University Of Padova,Italy
Dr. Muhsin N. HARAKEH	University Of Groningen,Netherland
Dr. Nils PAAR	University Of Zagrep,Croatia
Dr. Fabio CRESPI	Universita Degli Studi Di Milano-INFN,Italy

INVITED SPEAKERS

Investigation of Photonuclear Reaction Products from Gallium Target

AKKOYUN S.¹ and BAYRAM T.²

¹*Cumhuriyet University, Faculty of Sciences, Department of Physics, Sivas, Turkey
serkan.akkoyun@gmail.com*

²*Sinop University, Faculty of Engineering, Department of Nuclear Energy Engineering,
Sinop, Turkey, t.bayram@ymail.com*

Photonuclear reactions are important tools for understanding of the structure of atomic nuclei. Bremsstrahlung photons can be generated by hitting the electron beam to a heavy target by using clinic linac. Photo activation is performed by using these photons on target nuclei. The excited nuclei emits most probably neutrons and they get rid of their excess energies. This type of reaction is named as photoneutron reaction. In this work, 14 MeV maximum energy bremsstrahlung photons has been used for activation of Ga target nuclei. The reaction products have been investigated. According to the results, the half-lives of ⁶⁸Ga, ⁷⁰Ga ve ⁷²Ga and some energy levels of ⁶⁸Zn, ⁷⁰Ge ve ⁷²Ge isotopes have been determined. The results are consistent with the existing literature values. Furthermore, it has been shown that a clinical linac which is exist almost all research hospital can be used for important experiements such as transmutting the atomic nuclei to each other.

Keywords: *Photonuclear, Gallium, Half-life, Energy level, Clinic linac*

Nuclear MOX Fuel Burnup Analysis and Monitoring Using Non-Destructive Method

AKYUREK T.^{1,2} and USMAN S.²

¹Marmara University, Art & Science Faculty Physics Department, Istanbul, Turkey,
tayfun.akyurek@marmara.edu.tr

²Missouri University of Science and Technology, Nuclear Engineering Department, Rolla MO,
USA, usmans@mst.edu

UO₂ fuels are commonly used nuclear fuels in thermal reactors all over the world. However, Plutonium rich mixed oxide fuels (MOX) is being proposed to wider use in commercial nuclear reactors to reduce the weapon grade plutonium. United States is likely to join countries like; France, Germany, Belgium, and Switzerland to use MOX fuel for commercial nuclear power. As MOX fuel is an advanced nuclear fuel potentially utilizing weapon grade plutonium, hence there is a need for reliable monitoring at all times to ensure safeguard against proliferation concerns. Non-destructive analysis (NDA) are well-established method that can utilize either using photon or the delayed neutrons for monitoring spent fuel for accountancy of special nuclear material, burnup calculations, fuel cooling time, irradiation history, safeguard and ensuring adherence to proliferation control programs. The gamma and neutron based NDA technique is also used for measuring the composition of Pu and U in the spent fuel. Burnup indicators such as ¹³⁴Cs, ¹³⁷Cs, and ¹⁵⁴Eu are desirable isotopes to obtain burnup credit, irradiation history and cooling time parameters using gamma NDA for both UO₂ and MOX fuels.

In this study, a multitude of MOX fuel fission products identified as alternative candidates have been scrutinized for suitability of burnup analysis and spent fuel monitoring. The fission products of MOX fuel fission products are simulated and observed using ORIGEN-ARP (Oak Ridge Isotope Generation and Depletion Code-Automatic Rapid Processing). Best isotopes obtained for analysis by investigating half-life, fission yield, branching ratios, production modes, thermal neutron absorption cross section, fuel matrix diffusivity, suitable energy levels. ¹³²I and ⁹⁷Nb are identified as good isotope candidates for online burnup analysis. ¹³²I is also found to be a good isotope for Pu-U discrimination due to the large difference in the fission yield of the isotope. ¹³¹I, ¹⁴⁰La, ⁹⁵Nb are the alternative isotopes for Cesium for interim monitoring. For the long term storage monitoring ⁹⁴Nb is the only attractive candidate. The future work will experimentally investigate these isotopes using gamma NDA method.

An extension work of defining isotopes for MOX fuel analysis is performed with experimental burnup calculation and Pu-U discrimination using Missouri University of Science and Technology Reactor (MSTR) fuel by delayed fast neutron NDA method. Post-irradiated delayed fast neutron spectra were obtained for two pairs of spent and fresh fuels. Burnup and ²³⁹Pu conversions were calculated based on neutron emission rates. Burnup value is estimated to be 149 MWD/T and 196 MWD/T for fuel element 1 and 2, respectively. ²³⁹Pu conversion since 1992 was calculated as 0.24 g and 0.32 gr for low enriched fuel elements 1 and 2, respectively. Initial results are promising but more work is needed to fully develop an enhanced technique for spent fuel interrogation using delayed neutrons.

Keywords: Burnup credit, Nuclear fuel, MOX fuel, Pu-U discrimination

The So-Called Oslo Method: Simultaneous Extraction of Nuclear Level Density and Gamma-Ray Strength Function

ALGIN E.¹, AY K. O.¹, OZGUR M.¹, GUTTORMSEN M.²

¹*Department of Physics, Eskisehir Osmangazi University, 26480 Eskisehir, Turkey*

²*Department of Physics, University of Oslo, N-0316 Oslo, Norway*

kursadosmanay@gmail.com

The Oslo method is the only method to extract both the nuclear level density and the γ -strength function from a single experiment. The idea behind the method consists of the measuring the total spectra of γ -transitions initiating from different excitation energy intervals of the nucleus populated by some transfer reaction such as (d,p) or by an elastic scattering reaction such as (p,p'). The experiment measures the coincidences between outgoing particles populating the residual nucleus below particle separation threshold and sequential γ -transitions cascading down to the ground state. The outcome of such measurements is the particle- γ coincidence matrix $P(E_x, E_\gamma)$ where E_x is the average excitation energy of residual nucleus and E_γ is the average energy of γ -transitions de-exciting levels with excitation energy around E_x . The primary gamma matrix is then obtained by an iterative subtraction technique. This matrix can be decomposed into level density and γ -transmission functions. The details of the Oslo method and some results from a recent experiment will be presented.

Keywords: *Nuclear level density, Gamma-ray strength function, Oslo method*

Electrical Characterization and Sources of Energy Losses in Solar Cells

ALTINDAL Ş. and ÇETİNKAYA H. G.

*Physics Department, Faculty of Sciences, Gazi University, Ankara, Turkey
altundal@gazi.edu.tr*

Today, the main scientific and technical problems of photovoltaic (PV) solar cells (SCs) are relevant to the increase in the efficiency of them and to reduce in the energy losses. The efficiency and current-transport mechanisms (CTMs) of SCs are depend on various parameters such as the process of surface preparation, barrier height (BH) inhomogeneity, the concentration of doping atoms, solar temperature, density of surface states (N_{ss}), series and shunt resistances (R_s and R_{sh}) and applied bias voltage. In SCs or similar devices a number of CTMs such as thermionic emission (TE), thermionic field emission (TFE), field emission (FE), multistep tunneling (MT) and Gaussian distribution (GD) of BHs compete unusually, one of them may dominate over the others in a certain temperature and voltage region. When the electrical measurements were carried out in the wide of temperature and voltage could allow us to gain insight in to different aspects of characteristics such as CTMs and nature of BH at M/S interface. Especially, series resistance (R_s), interface traps (D_{it}) and temperature affects negatively the performances of SCs and this is an important issue for researchers. Recently, the origin of the increase in the BH and a decrease in ideality factor with temperature in some studies has been successfully explained on the bias of a TE theory with a GD of the BHs, but a complete description of CTMs through barrier and understanding of the nature of BH still remain a challenging problem.

Keywords: *Current-conduction/transport mechanisms, Gaussian distribution (GD) of BHs
Sources of Energy Losses in Solar Cells*

Prospection, the Role of the Geological Engineers In the Mine Prospecting and National Mining Policy

ARIK F.

*Selçuk University, Engineering Faculty, Geological Engineering Department, Konya,
Turkey, farik@selcuk.edu.tr,*

The main raw materials of industry, energy, construction, food and agriculture sectors, which are considered as determinant of living standards and development of the countries, are natural resources, in another saying is mines. Cement from sand, from plaster to iron, from pottery to marble used in the constructions, from salt in our table to drinking water, from the hood to fuel of the vehicles, from warming we needs to the ornamental stone, paving stone to tombstone; in shortly, the vast majority of the materials we use for our most basic needs from cradle to grave are obtained from mines as crude, intermediate or end products.

Mining appear as the most important development criterion and power factor throughout human history and historical ages have received names according to the type of natural resources that have been used by mankind such as Stone Age and Bronze Age. Nowadays, founded from the agreement to use of common coal and iron beds in the border of Germany and France in the basement of the European Union that we are trying to join with the great efforts, and considering the developments in our region and world in the living period the importance of mining is emerging clearly.

Mines are formed for long geological periods under very special conditions in some areas of the world and resources that cannot be put into place after once produced. Mining will be held for mining operations that have to operate in places where transportation, communication, energy, water and other infrastructure investments that contribute to the region are primarily located. In addition, mining as a labor-intensive sector is the needed labor arises generally provided nearby and the positive and negative effects of mining operation directly near environment and provided of economic contribution to the region.

Turkey is rich in the diversity of mineral resources and the geological features of our country's reserves of more small-to-medium, permits the formation of ore deposits. Including the particularly boron and trona, energy and industrial raw materials such as thorium, lignite, marble, magnesite, rare earths, zeolite, barite, feldspar and sodium sulfate compete with the world, metallic mines such as chromium, aluminum, iron, copper, lead-zinc, etc. it is known that we have the reserves should be sufficient to the domestic industry. However, location of the mining in the country's economy are in the very back row.

Because of the impossible to work on something that is not, the most important issues in the mining operation reveal the presence and exploration activity of mines. No longer is the chance of the amateur person or group to explore of surface mine with a simple observation very low in the world. Geological Engineers should the education they receive having preliminary information about the geological environment of ore deposits, they can know a strong possibility places which might be embedded mines based on observed a rock, mineral or alteration zones on the surface. Therefore, the mineral exploration must be made on the basis of scientific data by geological engineers who are expert in these matters

For the exploration of ore deposits with the most economical and efficient methods, geological and stratigraphy position, structural geological, geochemical, mineralogical, petrographic and hydro geological characteristics of mines are needed to be investigate in detail. In the light of this data, relatively expensive geophysical and geochemical methods such as half and drilling which will be implemented in intensity also should be still to be decided by geological engineers petrographic, mineralogical, geochemical and hydrogeological methods could be reveal; mineral species, the distribution in wall rock of theirs, depending on which sources which came under formation conditions and enriched in the investigated area. The possible routing of ore bodies broken and the displaced by faults may reveal is well known structural geological features. It can be revealed mineral deposits have a similar mechanism and the presence of yet unknown with these methods. Thus, addressing previously of the knowledge and practice of geological engineering is an unavoidable necessity in mining exploration.

During the mining operation of the mine site should be constantly kept under observation by geological engineers and mining operators. Potential problems that may occur during production must be resolved immediately and continuity should be ensured. Then evaluated by the prevailing economic conditions should be avoided so as not to plunder gotten more of a potential mine. Operated in an ore deposit the waste of metal that can be recovered economically worth expressing and by-products, structural geological features formed by what the potential risks, for the solution of poisonous gas, water and other problem in underground mining should benefit from the practice and information of geological engineering.

After the abandonment of an ore deposits which production completed economically, it can be benefiting from the advice of all disciplines and scientists relevant to eliminate or at least be reduced negative environmental impacts that may arise. An example, investigation of economic ore likely in the field where the accumulated rust, surface and groundwater and its effects on forests and vegetation, the gases, particles can be released into the atmosphere should be investigated by appropriate methods and adverse effects must be disposed.

Proposed National Mining Policy in order to gain the country's economy of our mines efficiently; all parties overseeing the scientific knowledge, investment and investment risk, employment, added value, technology and coordination parameters, environmental, agricultural, cultural and other natural resources, and involved in mining operations that have a voice and decision, is based on an approach that considers the public interest in all mining stages such as from exploration to production, from marketing to abandonment.

Keywords: *Mining, Mine exploration, National Mining Policy, Geological Engineering*

Factors Affecting the Quality of Groundwater Resources and Its Effects in Turkey

BABA A.

Izmir Institute of Technology, İzmir, Turkey, alperbaba@iyte.edu.tr

Many civilizations have been located along the water basins throughout history. Civilizations have enabled the survival and growth by these water resources in world. For natural wealth, the need of water is increase. Therefore, investigation of the water potential, available of protection, efficient and planned use has begun to supply vital.

Groundwater has been used widespread for drinking and domestic use in Turkey where hydrogeological structure is very complex. Generally groundwater resources have been affected by natural and anthropogenic in Turkey. Majority of drinking water include natural contamination which may affect human health. High arsenic, manganese, iron and aluminum can be seen in wells which have been drilled in altered volcanic rocks and tectonic zones (Example: Biga Peninsula and north Aegean Region). In addition geothermal fluids have been effected cold groundwater in geothermal region such as Simav and Gediz Graben where high fluoride and boron concentration can be seen.

High arsenic concentration up to 2000 ppb was measured in western Anatolia where high boron concentration in cold (12 ppm) and hot groundwater (69 ppm) were measured. These values exceed drinking water limits. Therefore this water can affect human health.

Keywords: *Heavy metals, Arsenic, Boron, Fluoride, Groundwater*

Underground Thermal Energy for Sustainable Development: Available Methods for Seasonal Solar Thermal Energy Storage

BASER T., MC CARTNEY J.S.

University of California San Diego, La Jolla, USA, tbaser@ucsd.edu

Since limited source of fossil fuels has begun to diminish with growing heat demand and increasing population, there is a substantial need to accelerate the sustainable energy technologies to solve reoccurring challenges of energy crisis. Although the consumption of fossil fuels can be slowed by reducing excess energy wastes and conserving energy, it is eventually necessary to substitute them with renewable energy alternatives. Solar thermal energy is one of the renewable energy resources to take advantage of free and sustainable energy. It produces most of their heat when it is not required and hence, it is wasted. Utilizing solar thermal energy can be achieved using the ground as a storage medium. Solar thermal energy storage systems are a unique way among all renewable energy system among the other renewables such as wind, biomass, geothermal, etc. and are proven to be an efficient tool to store the thermal energy in the subsurface. They function by storing excess energy during low heat demand periods and harvesting it at a later time when the demand is high. While these systems are gaining popularity, much attention is still given to understand the fundamentals and an efficient design. This presentation will discuss the types of underground solar storage systems and their functions as well as their applications in North America and Europe.

Keywords: *Underground storage systems, Solar thermal, BTES, ATES, CTES*

Investigating the P-T-X Conditions of Hydrothermal Fluid Flow Responsible for Au-Ag-Base-Metal Mineralization in the Biga Peninsula

BOZKAYA G.

*Pamukkale University, Engineering Faculty, Geological Engineering Department
Denizli, gbozkaya@pau.edu.tr*

The use of fluid inclusions can be an effective means of understanding the fluids in epithermal deposits. The Biga Peninsula and western Turkey in general contain many epithermal deposits whose characteristics are similar to the mineralization at Tesbihdere, Koru, Arapucandere, Balcilar and Kumarlar. Many of these deposits have had fluid inclusion research that show a similarity in the salinity and temperature of the mineralization. These are what might be expected from the general model and vertical structure for this type of mineralization and other deposits worldwide.

Epithermal deposits in western Turkey contain fluid inclusions with very large ranges of homogenization temperatures that cannot be explained by mixing with cooler meteoric fluids. Often salinity variations are at relatively constant temperature. L-V, V-L and boiling assemblages, in the ore veins, are observed to homogenize at temperatures c. 320-350°C thereby constraining the minimum depths to c. 2000m at hydrostatic pressure (which does not fit with the geological evidence) or c.700m at lithostatic pressure. The range of homogenization temperatures for L-V inclusions, that are not obviously of a different generation, decrease to c.250°C in most deposits. This temperature is exactly what would occur if the higher temperature, near lithostatic fluid, lost heat by adiabatic expansion as the pressure regime changed to near hydrostatic at the same depth of vein emplacement. In most instances boiling is not a major occurrence; therefore the pressure decrease from lithostatic to hydrostatic must have been gradual enough for cooling to occur more or less along the L-V curve. However, there are examples of where the pressure decrease was catastrophic as there are examples of “flashed fluids” that are present as inclusions that only contain a very low density vapour. This is only likely to occur when the pressure goes from lithostatic to sub-hydrostatic most likely due to movements caused by earthquakes.

Mineralization in Biga Peninsula primarily results from variations between lithostatic and hydrostatic pressure but there is evidence of “flashed fluids” from sudden sub-hydrostatic pressures resulting in adiabatic expansion and cooling of the ore fluid that is largely of magmatic origin, with little evidence supporting mixing with meteoric fluids.

Keywords: *Biga Peninsula, Au-Ag-Base Metal, Fluid Inclusions*

Clay Occurrences Related to Hydrothermal Ore Deposits: Indicator for Condition, Origin and Age

BOZKAYA Ö.

*Pamukkale University, Dept. Geological Engineering, Denizli, Turkey,
obozkaya@pau.edu.tr*

Hydrothermal alteration-related clay occurrences have important vestiges for conditions, origin and age of hydrothermal activities. Hydrothermal alteration is often accompanied by hydrothermal ore deposits and active geothermal systems which are of economic importance. The interaction of hydrothermal fluids with wall rocks and/or the hydrosphere and changes in their composition through time and space, contribute to the formation of a wide range of mineral deposit types and associated wall-rock alteration.

Clay minerals can be produced by hydrothermal alteration according to three different pathways: (1) transformation of pre-existing high-temperature silicates, (2) transformation of pre-existing clay minerals and (3) direct precipitation from fluids. Formation of clay minerals under hydrothermal influence is the result of rock alteration by circulating hot water in the Earth's crust. A pre-existing rock forming mineral assemblage is altered to a new set of minerals which are more stable under the hydrothermal conditions of temperature, pressure, and fluid composition. Hydrothermal alteration is alteration controlled by variations of all three factors of solution composition, temperature, and pressure. As the number of variables increases a greater variety of clay minerals can be expected to form under hydrothermal environments. In hydrothermal systems, the factors controlling clay formation (kaolinization, illitization and/or sericitization) processes (temperature, time, fluid composition, fluid/rock ratio) may differ from those of burial diagenesis. Time has a negligible effect because the formation generally occurs during a short period (or short-lived geothermal systems).

Clay mineral types and/or associations related to alteration zones (argillic-kaolinite, dickite, pyrophyllite-, phyllic/sericitic-illite, propylitic-chlorite, potassic-biotite) point out the temperature and pH conditions. The stable isotope (oxygen and hydrogen isotope) data of clay minerals indicate the origin of hydrothermal fluids (magmatic, meteoric) and temperature conditions. Additionally, K-bearing clays (mixed-layered illite-smectite, illite) and micas (muscovite, biotite, phlogopite) may allow the K/Ar, Ar/Ar or Rb/Sr dating for hydrothermal alteration. Finally, clays have an important key role to understand the evolution of hydrothermal ore deposits, and have a great potential to explore new ore deposits, as well.

Keywords: *Clay minerals, Hydrothermal alteration, Mineralogy, Stable and radiogenic isotopes*

The Effect of the Deformation Parameter on the Cross Sections for $^{110}\text{Pd}(d,n)^{111}\text{Ag}$ and $^{110}\text{Pd}(d,2n)^{110}\text{Ag}$ Reactions

BÖYÜKATA M.¹, SARPÜN İ.H.², AYDIN A.³

¹*Kırıkkale University, Faculty of Science and Arts, Physics Department, TR-71450, Kırıkkale, Turkey, boyukata@kku.edu.tr*

²*Afyon Kocatepe University, Faculty of Science and Arts, Physics Department, TR-03200, Afyonkarahisar, Turkey*

In this work, we have investigated the effects of the deformation parameter on the cross sections for the $^{110}\text{Pd}(d,n)^{111}\text{Ag}$ and $^{110}\text{Pd}(d,2n)^{110}\text{Ag}$ reactions up to 20 MeV. The deformation parameter (β) of the target nucleus (^{110}Pd) can be obtained within Interacting Boson Model-1 (IBM-1). The main purpose is to use the this deformation parameter in the TALYS 1.6 code to calculate the cross sections on these reactions. For this process, the energy levels of the target nucleus have been calculated by fitting the Hamiltonian parameters and then these parameters have been used in $V(\beta,\gamma)$, the potential energy surface (PES). Later, the energy surface have been plotted as a function of deformation parameters (β,γ) to visualize the geometric shape of the even-even ^{110}Pd nucleus and to obtain β parameter. The cross sections of the $^{110}\text{Pd}(d,n)^{111}\text{Ag}$ and $^{110}\text{Pd}(d,2n)^{110}\text{Ag}$ reactions have calculated by using this parameter in the TALYS 1.6 code. Moreover, some other deformation parameters (obtained Ripl, TALYS default, etc.) have used to compare with each other and also the experimental data from EXFOR.

Keywords: *Cross section, Deformation parameters, Interacting Boson Model, Talys 1.6, Exfor, Potential energy surface.*

Evaluation of Relation of Delice River and Aquifer Systems Based on Groundwater Quality in the Vicinity of Yerköy (Yozgat)

ÇELİK M.

Ankara University, Geological Engineering Department, 06100 Tandoğan, Ankara
mehmetcelik@ankara.edu.tr

Yerköy area 190 km east of Ankara, is located approximately between latitude 39°30'-39°45'N and longitude 34°15'-34°45'E. Shallow alluvial aquifer, geothermal system and Delice River are located in the area. The aim of this study was to investigate the interaction between surface and groundwater by hydrochemistry. Three characteristic facies were determined based on the results of hydro-chemical analyses: (1) Na⁺-Cl⁻ water type was greater the deeper aquifer, (2) Na⁺-SO₄⁻² water type was the portion of the shallow alluvium aquifer, and (3) Na⁺-HCO₃ (SO₄⁻²) water type represented the western portion of the shallow alluvium aquifer. By graphical evaluation, there were the relation between Delice River and alluvium aquifer, but no relation the deeper aquifer between the others. Based on the hydro-chemical studies it was found that the water of the Delice River is suitable for irrigation and domestic use whereas the water from the shallow aquifer is extremely saline and considered to have been polluted by local lithological units. Active groundwater circulation and dilution between the alluvium aquifer and the Delice River was observed. In order to suitable irrigation and domestic use of the Yerköy alluvium aquifer, it should be diluted by Delice River water. Also for these, suggested that drainage and recharge system must be constructed in the area.

Keywords: *Water quality, Surface water/groundwater interaction, Hydro-geochemistry, Dilution, Yerköy-Yozgat*

New Trends in the Photovoltaic Technology

ERKOVAN M., BULAT S.

*Sakarya University, Sakarya, Turkey,
merkovan@sakarya.edu.tr*

The energy consumption of the Earth and especially of our country is every year growing up. It is proven that fossil based energy sources are harvesting our planet. Renewable energy sources are getting more importance. Because of our countries geographical position, the solar energy has a higher potential, in contrast to the European Countries.

The main topics of our research about the photovoltaic systems are, to increase the efficiency and to decrease the manufacturing costs. The amount of the silicon used for the production of an amorphous solar cell is very lower than the silicon used for the production of a crystalline based solar cell and because of this the manufacturing costs of amorphous solar cells may be lower. We aim to gain more energy per used silicon or other semiconductor material for the production of Amorphous Solar Cells in contrast to other types of solar cells, to have a more sustainable type solar cell.

Organic solar cells also have potential for being a more inexpensively way for producing electrical energy directly from sunlight via photovoltaic technology while minimizing the harmful effects on the environment by reducing the emissions. Recently researches about organic solar cells have brought this technology from university laboratories to industrial laboratories. Organic solar cells are manufactured from polymers and molecules and because of this they are easier and may be cheaper to produce in contrast to current solar cell manufacturing technologies.

Keywords: *Photovoltaics, Amorphous solar cell, Organic solar cell*

Role and Importance of the Magnesite Ore

EROL M.Ş.

KÜMAŞ Manyezit A.Ş.

Magnesite is a mineral with the chemical formula $MgCO_3$ (magnesium carbonate). Magnesite is a naturally occurring carbonate of magnesium that is colorless, white, grayish white, yellowish white, brownish white. It is eight most abundant element in the earth. Magnesite occurs in two distinct physical forms: macro crystalline and cryptocrystalline. Magnesite ore is designated as critical raw material by European Commission.

KÜMAŞ is Founded in 1972 as a public joint - stock company, started to produce sinter magnesite from natural magnesite ore in 1976. KÜMAŞ became an integrated company after completed the installation of its brick and mortar production facilities in 1990. KÜMAŞ is the largest producer and supplier of refractory products for steel, cement, glass, lime, nonferrous and some other industries in Eastern Europe and Turkey. KÜMAŞ is one of the unique examples of refractory producers in the world who has its own raw materials.

Keywords: *Magnesite, Refractory, Raw materials, KÜMAŞ*

Possible Nuclear Power Plant Types for Turkey in the Future, Nuclear Energy and Technology Policies.

ERTÜRK S.

Ömer Halisdemir university, Science and Art Faculty, Department of Physics, Nigde

In this presentation, the discovery of nuclear energy, nuclear reactors, reactor types, nuclear fuel types, management of radioactive waste from energy production and construction details and agreement conditions of Akkuyu and Sinop nuclear power plant to be built in Mersin and Sinop, Turkey will be discussed. Furthermore, policies about different energy sources and energy power plants will be discussed.

Keywords: *Nuclear energy, Nuclear reactors, Power plants*

The Late Mesozoic-Cenozoic Magmatism and Related Mineralizations in North-Eastern Turkey

EYÜBOĞLU. Y

*Karadeniz Technical University, Department of Geological Engineering, 61080, Trabzon
yenereyuboglu@gmail.com*

The Late Mesozoic-Cenozoic geo-dynamic evolution of the North-Eastern Turkey is still controversial due to lack of systematical geological, geo-chemical and geo-chronological data. The popular idea is that the eastern Pontides orogenic belt was shaped by the north ward subduction of an oceanic lithosphere (Neotethys Ocean) in Cretaceous and following collision between Pontide and Tauride blocks in Early Cenozoic. According to this popular theory, volcanogenic massive sulfide (VMS) deposits exposed along a parallel line to the south eastern coast of Black Sea are Kuroko-type deposits that were formed in the back-arc basin environment during the Late Cretaceous and the origin of epithermal gold deposits hosted by Eocene volcanic rocks is related to granitic magmas that were generated in a post-collisional setting during the Early Cenozoic. However, in recent years, our systematic geological, geochronological and geochemical studies on the Late Mesozoic and Cenozoic magmatism in the region have negated the popular idea. The new data set indicates that the origin of the Late Cretaceous VMS and also Cenozoic epithermal gold deposits in the north-eastern part of Turkey are related to felsic magmas that were produced during south ward subduction zone of Tethys oceanic lithosphere.

Keywords: *Late Mesozoic-Cenozoic Magmatism, Subduction Zone, Epithermal Gold Deposits, Volcanogenic Massive Sulfide (VMS) Deposits,*

Mineral Resources Potantial in Yozgat Province

GÖKCE A.

*Cumhuriyet University Department of Geology Sivas/Turkey
gokce@cumhuriyet.edu.tr*

Iron, manganese, lead-zinc, fluorite, feldspar, quartzite, marble deposits and prospects are widespread in Yozgat Province. Hot water springs and uranium prospects provide resources for geothermal and nuclear energy.

In addition to those known resources; rock types and paleo-geological and geo-tectonically environments encourage the possibility of new resources of various elements and minerals.

The areas covered by metamorphic rocks occur speculative and hypothetical potential terrain for marble, feldspar, mica minerals and vermiculite. Specularitic hematite rich schists may be used as iron ore. Kupferschiefer type copper-lead-zinc deposits may be occurred in amphibolite-schist levels.

Granitoids have S type characteristics and may host porphyry tin-tungstite deposits besides the known skarn type lead-zinc and fluorite deposits. Ophiolitic rocks may host chromite, asbestos, talc and magnesite deposits besides the known chromium and manganese deposits and prospects. Basaltic volcanics in ophiolites may contain Cyprus type copper ores. Eocene and Oligo-Miocene volcanics may contain hydrothermal gold deposits. Eocene sediments may contain new coal deposits. Oligo-Miocene sediments are the potential terrains for gypsum, salt and low quality lignite resources.

As the results, mineral resources potential of Yozgat Province is rather high and new mineral deposits may be found with well-directed exploration programs.

Keywords: *Mineral resources, Copper-Lead-Zinc Deposits, Tin-Tungstite Deposits, Chromite, Asbestos, Talc And Magnesite Deposits, Yozgat Province*

Sustainable Development and Geology

GÜNGÖR Y.

Istanbul University Department of Geology Avclar İstanbul, yildirimgungor@gmail.com

Accurate, planned and regular and usage of the natural resources and supporting each other, by determining the recycling processes of them to built human/nature relation without causing permanent damages to the sensitive natural balance is the pre-condition of living a healthy and happy life. In addition to this, for “development” production impulse more than requirement may cause the consumption of natural resources quickly and irrevocably. In the 18th century, converting the big residential areas into a desert after a while as a result of “Gold Rush” in the various regions of the world, continuing some of them to cause to environmental pollution is one of the good examples for this situation. In that case, because human’s life quality increases together with the population increase, but in proportion with it, it is necessary to be handled this process as to make production in proportion that it ensures a certain life quality within the living conscious without “plundering”. But and in only this case it can be mentioned “Sustainable Development”. The most important condition of this sustainability is being guaranteed physical and mental health of persons in each social class and age and living at this region even at a minimum level . And it is possible by sequence by participating the persons living at the mentioned region and gaining material and moral saturation.

To settle in a region is depending on some certain rules even in the nomadic societies. For example, closeness to the water resources, hunting opportunities, existence of raw material resources, may be necessary by life style are only a few of them. All of these settlements and natural resources locate in a “Geological Environment” and dynamic and natural processes of earth crust work with a constant precision everywhere on the earth. In that case, it is mandatory that ensure compliance between these settlements and geologic processes. Therefore, to be aware of these natural processes, to recognize them by scientific criteria and to make their possible future projections for different periods are the responsibility of geologists, who are taken training of this job.

Determining of “Geological Heritage” factors consist of a part of natural resources surrounding a settlement has also started to gain a great importance on a global scale in recent years. Handling of them sometimes as singular, sometimes as a whole as regulations may contribute positively to the socio-economic nature of people living accuretly and schemingly in the region is possible as “Geo-park” regulations. Therefore, it is ensured that the people, living in this region are aware of the biological assets as well as the conscious of making these assets a part of their social-economic lifes is developed and protected them effectively and handed down the next generations. Only under these conditions it can be mentioned “sustainable development”. In this notice, it will be discussed the possible contributions of geological heritage factors of earth generated within 4.6 billion years-life period on the local sustainable development processes.

Keywords: *Geological Heritage, Geosite, Geopark, Sustainable Development, Environment*

Shallow Geothermal Systems and Their Feasibility in Turkey

KADIOĞLU Y.K.

*Ankara University Geological Engineering Department, Turkey
Earth Science and Application Center of Ankara University (YEBİM)
kadi@ankara.edu.tr*

Energy is the most important demand of the human life. Alternative energy resource investigations are increased by the increasing of the population. Oil, gas, wind and geothermal resource are the most natural energy resources. Oil and gas energy are restricted energy and are found in a few countries in the world. Geothermal energy has considerable economic potential only in high thermal water or steam which can be found at depth of >400 m. High thermal water are also restricted in spatial geological conditions in some countries in the world. However, using the geological formations and their mineralogical behaviors/features at shallow depths made possible for all countries to use the underground heat of the earth for heating and/or cooling for the human demands as shallow geothermal system. The shallow geothermal systems mostly represent the depth of the less than 400 m depths and mostly uppermost 100m of the Earth's crust.

The shallow geothermal systems constructed on the using undisturbed ground temperature that forms the basis of heat extraction or heat injection varies between <2°C and >25°C, depending upon the climatic condition, mineralogical compositions, textural features and moisture of the lithology of the borehole. The principle of the shallow geothermal systems is increasing the undisturbed ground temperature by the heat pumps. The uses of shallow geothermal systems are increased by the developments of heat pumps Technologies. Geothermal heat pumps use the earth as a heat source by circulating water loop in the system. The shallow geothermal system can be used in summer, as a cooling mode, using the ground for the heat contained within the building.

Turkey is located in Alpine belt and are rich in young magmatic activities which may led to heat the ground and groundwater in most area of the country. Heating the ground and the ground water gain a great potential for the shallow geothermal energy. Turkey has warm climate, warm moist soils, and rich with the high thermal conductivity minerals which is most suitable for harnessing shallow geothermal energy resources. The demand of the renewable energy is increased by increasing the excess consumption of the energy in Turkey. The rocks type, the mineralogical compositions of the lithology and moist soil in Turkey allows the shallow geothermal to be more convenient for producing the energy. The undisturbed ground temperature are variable according to the tectonic positions and mineralogical compositions of the regions in Turkey. The undisturbed temperatures of the ground range from 10 °C up to 25 °C or more which led to have a great potential for producing the energy from the shallow geothermal systems in Turkey.

Keywords: *Shallow Geothermal systems, Borehole, Producing the energy, Ground temperature*

The Solutions of Neutron Transport Equation: Theory and Applications

KAŞKAŞ A.

*Ankara University Faculty of Sciences Department of Physics, Ankara, Turkey
kaskas@science.ankara.edu.tr*

Linear transport equations arise in the fields of radiative transfer, neutron transport theory, the theory of plasmas etc. The distribution of neutrons in a reactor is described by the neutron transport equation. There are three forms of neutron transport equation. The first form which is also known as Boltzmann equation is solved by using the methods of Case, F_N , P_L , etc., the second form is an integral form equation and solved by using Variation method. The third form of the neutron transport equation is solved by using C_N method. Monte Carlo computer codes are also used to simulate the reactor physics calculations using Boltzmann equation. The neutron transport equation is used to solve to some physical problems as, albedo, criticality, extrapolation lengths for Milne problem for different geometries and various scattering cases.

Variation of Trace and Radioactive Elements in Oil Shales: A case study on Hatıldağ and Çayırhan Oil shales

KOÇ Ş.¹, YAVUZ PEHLİVANLI B.², SARI A.¹

¹Ankara University, Engineering Faculty, Department of Geology Engineering, 06100, Tandogan, Ankara, Turkey, sukru.koc@eng.ankara.edu.tr

²Bozok University, Department of Geological Engineering, 66100, Ataturk Yolu, Yozgat, Turkey

In addition to their hydrocarbon generation (e.g. oil, gas), oil shales also significantly accumulate several elements such as Mo, Ni, Co, V and Cu as well as some radioactive elements such as U and Th. Shales with high uranium content have also high carbon contents and are of marine origin. However, oil shales formed in a lacustrine environment may also have high U concentrations. Organic material content of the rock and redox conditions are the main factors facilitating radioactive element enrichment.

Radioactive materials which occur naturally and where human activities increase the exposure of people to ionizing radiation are known by the acronym 'NORM'. All minerals and raw materials such as oil shales contain radio-nuclides of natural origin. The most important for the purposes of radiation protection are the radio-nuclides in the U-238 and Th-232 decay series. Long-lived radioactive elements such as uranium, thorium and potassium and any of their decay products, such as radium and radon are examples of NORM. These elements have always been present in the Earth's crust and atmosphere, and are concentrated in some places, such as uranium ore-bodies which may be mined. NORM issues include; the coal industry (mining and combustion), the oil and gas industry (production), metal mining and smelting, mineral sands (rare earth minerals, titanium and zirconium) fertilizer (phosphate) industry, building industry, recycling.

Most organic matter such as oil shale, oil, gas and coal contains uranium and thorium, as well as their decay products and K-40. Gamma-ray values generally reflect abundance of radioactive elements in rocks such as uranium, thorium and potassium. Uranium, thorium and potassium abundances in Çayırhan and Hatıldağ oil shales and gamma-ray values are strongly. Positive correlation of gamma-ray values with U, Th and K concentrations might show that radioactivity is originated from these three elements both Hatıldağ and Çayırhan oil shales. Very low uranium concentrations of Çayırhan Oil shales are suggested to be associated with oxic and dysoxic redox conditions of depositional environment. Dysoxic and anoxic conditions may occur by oxygenation of lake water and development of aerobic micro-organisms and algae during rainy seasons and by dys-oxygenation during dry seasons.

On the other hand Hatıldağ oil shales was deposited in lacustrine environment with continuously varying water level, uranium might be dissolved due to oxygenation of water column occasionally. Dys-oxic and anoxic levels revealed from redox-sensitive element ratios might imply that Hatıldağ oil shales was occasionally exposed to redox conditions and uranium minerals deposited at the lake bottom were dissolved to transfer uranium to the water column.

Keywords: Trace Elements, Radioactive Elements, NORM, Hatıldağ oil shales and Çayırhan oil shales.

Piezoelectrics as Micro-Energy Devices

KURT E.

*Gazi University, Technology Faculty, Department of Electrical and Electronics
Engineering, 06500 Teknikokullar, Ankara,
ekurt@gazi.edu.tr*

The piezoelectric materials (PM) have become a good micro-energy resource for many applications. The off-grid applications, sensors and small devices have become the major candidates to require piezoelectric energy materials. Considering their energy scales and renewable energy production ways, the batteries can be replaced by them in many applications in order to avoid the chemical materials. However, PM suffers from various effects such as the power-frequency dependence and maximal power point determination. In that study, some clues on the harvested power relations to the piezoelectric system parameters will be described in the magnetic media. Thus, the contactless repelling effect of magnets should be described in order to avoid the physical damage of the PM. In addition, some experimental and theoretical findings will be discussed for a new magneto-piezoelectric wind energy harvester.

Keywords: *Piezoelectric, Harvester, Magnetic, Contactless.*

Static and Dynamic Effect in Halo Nuclei Interactions

KÜÇÜK. Y

*Akdeniz University, Physics Department of Physics, Antalya-Turkey,
ykucuk@akdeniz.edu.tr*

In this talk I will discuss the dynamic effects come from the coupling to the breakup channels in the elastic scattering of proton and neutron halo nuclei. I will show some Continuum Discretized Coupled Channels (CDCC) model calculations for the elastic scattering of ${}^6\text{He}$ and ${}^8\text{B}$ nuclei on different targets to show where the breakup coupling effects become dominant.

Keywords: *Halo nuclei, CDCC*

Geothermal Energy Storage in Unsaturated Soils

MC CARTNEY J.S. and BAŞER T.

*University of California San Diego, Department of Structural Engineering,
mccartney@eng.ucsd.edu*

Unsaturated soils provide an excellent location for storing thermal energy due to their relatively low thermal conductivity and good specific heat capacity. This presentation will introduce the fundamentals of heat and water flow in unsaturated soils, and will present the concept of borehole-thermal energy storage (BTES) systems which are used to inject heat from renewable sources (solar thermal panels) into a concentrated volume of soil in the subsurface until it can be later extracted for heating of buildings. BTES systems are a good strategy for providing renewable and low-cost district heating on a community scale. This presentation will also present results from a case study on solar thermal energy storage involving a BTES system installed in San Diego. The BTES system consists of an array of fifteen 15 m-deep boreholes installed in conglomerate bedrock. The entire site is above the water table, with relatively dry subsurface conditions. Instrumentation was included into the array to monitor temperature distributions with depth and radial spacing within the array, as well as water content fluctuations near the ground surface. A total of eight evacuated tube solar thermal panels were connected in series to supply heat to a temporary heat storage tank. After an independent evaluation process of the heat flux into the solar thermal panels, transient heat injection into the SBTES system was permitted over the course of 6 months. In addition to presenting details of the design and construction of the BTES system, data will be presented on the transient heat storage processes. This includes data on the characterization of the thermal properties of the BTES system, the transient heat flux collected from the solar thermal panels, and the corresponding transient heat flux into the subsurface. The performance data from the solar thermal and BTES systems from this case history will be put into perspective with the typical demands of a typical residential building, which can be used to estimate the required sizing for BTES systems of different scales of communities.

Dating Studies at Ankara University

MERİÇ N.

Ankara University, Institute of Nuclear Sciences,
meric@ankara.edu.tr

OSL (Optically-Stimulated Luminescence) is a late Quaternary dating technique used to date the last time quartz sediment was exposed to light. As sediment is transported by wind, water, or ice, it is exposed to sunlight and zeroed of any previous luminescence signal. Once this sediment is deposited and subsequently buried, it is removed from light and is exposed to low levels of natural radiation in the surrounding sediment. Through geologic time, quartz minerals accumulate a luminescence signal as ionizing radiation excites electrons within parent nuclei in the crystal lattice. A certain percent of the freed electrons become trapped in defects or holes in the crystal lattice of the quartz sand grain (referred to as luminescent centers) and accumulate over time (Aitken, 1998). In our laboratory, these sediments are exposed to an external stimulus (blue-green light) and the trapped electrons are released. The released electrons emit a photon of light upon recombination at a similar site. In order to relate the luminescence given off by the sample to an age, we first need to obtain the dose equivalent to the burial dose. Following the single-aliquot regenerative (SAR) method of Murray and Wintle (2000), the dose equivalent (De) is calculated by first measuring the natural luminescence of a sample. Then, the bleached sample is given known laboratory doses of radiation, referred to as regenerative doses. The regenerative dose data are fit with a saturating exponential to generate a luminescence dose- the generated curve. A curve is generated for each aliquot (subsample), multiple aliquots are needed to obtain an accurate De.

Finally, the age of the sample is calculated by dividing the equivalent dose (De) by the dose rate of the environment surrounding the sample:

$$\text{Age (kyr)} = \text{Equivalent Dose (Gy)} / \text{Dose Rate (Gy/kyr)}$$

Aitken, M.J., 1998, An introduction to optical dating: The dating of Quaternary sediments by the use of photon-stimulated luminescence: Oxford, University Press,

Murray, A.S., and Wintle, A.G., 2000, Luminescence dating of quartz using an improved single-aliquot regenerative-dose protocol: Radiation Measurements, v. 32, p. 57-73
response curve. The De is calculated by the intercept of the natural luminescence signal with

Keywords: Dating, OSL, Luminescence, Institute of Nuclear Sciences

Oil Shale Rock as an Alternative Energy Raw Material Used for Oil/Energy Production, Ongoing Projects and Potential of Turkey

MURAT. A

*Turkish Coal Enterprises (TKI), Ankara,
murata@tki.gov.tr*

Oil shale rock has an important place in organic rocks, insoluble in organic solvents “kerogen” fine-grained sedimentary rock containing materials and is often described as made of thin laminated. It is also known as bituminous schist in Turkey. Oil shale is organic rock type which is a kind of raw energy sources that produce oil and gas when heated under vacuum. In the literature, the most commonly used name is oil shale.

In today’s world already, oil shale rock is used in production of shale oil/energy in a commercial scale in many countries. In terms of primary energy sources of raw materials located in Turkey, oil shale has the second largest reserves after lignite. It is emerging as an alternative energy source with significant potential. In Turkey, according to MTA records there is eleven (11) separate oil shale fields (Bolu-Göynük, Mengen, Ankara-Beyşehir, Nallıhan, Kütahya-Seyitömer, Niğde-Ulukışla, Yozgat-Sorgun, Amasya-Celtek, Çorum-Dodurga, İzmit Bahçecik and Balıkesir-Edremit) have a total of 1.64 billion tons (apparent reserve). Although presence of oil shale rock reserves known in Turkey, If new geological surveys and exploration projects on oil shale reserves are held within the plan and program, oil shale reserve will be expected to be increased to 15.00 billion tons.

Oil shale resources are being used in shale oil/retort gas production in Estonia, China, Russia, Brazil and Germany and also it is used efficiently in oil shale fired power plants to generate electricity in Estonia today. Additionally, In the United States, Jordan and Morocco, commercial scale investment in energy/production continues for oil shale projects.

The process of combustion, pyrolysis (retorting) and extraction are scientific and technological methods to produce shale oil/energy. According to MTA and MİGEM records, it is understood that there is no enough quantity of oil shale production, R & D, technology development project plan and the program in Turkey. However, in 2012 at a meeting of the Supreme Council of Science and Technology 26 th. Coal Gasification and Development of Liquid Fuel Production Technology [2013/206] creating projects aimed to be completed by 2023. In addition, the government’s 10th Development Plan (2014-2018) new projects under the uncovering of domestic resources based energy production program action plan policy section 3 of oil and natural gas production potential of our country through non-traditional methods have been created.

TKI Authority, the main requirement of Article 4 of the Statute; State lignite in accordance with the overall energy policy, peat, oil shale, evaluate the natural resources like lignite to meet the needs of the country, has a maximum contribution to the national economy, plans and programs to organize, to follow, to determine the strategy and is tasked with ensuring the achievement.

TKI, shown above goals in mind and 2015-2019 value added that oil shale reserves have in the framework of the strategic plan to transform the high quality products, highly efficient and environmentally friendly industrial plants to establish the purpose of the oil shale reserves of the country with which nearly half of Bolu-Göynük (2 licenses) and Ankara-Nallıhan (5 units license) exploring oil shale resources in the field of oil/gas production retort with aims to determine the availability of fuel for thermal power plants.

TKI launched on 7 February 2013 in a joint R & D projects with TPAO in accordance with a protocol signed. In the project, the fieldwork has completed and studies is being continued to finalize the pre-feasibility study. Project partners have made calls aiming introduction of oil shale resources to countries having oil shale technology. Partners continues to research local and foreign investors.

Our country, the energy it consumes only one-fourth meet from its own resources. The remaining large portion is supplied by imports. Provision of electricity production in our domestic and renewable energy sources to avoid all the circuit until you get to the diversification of domestic resources in energy production and energy supply security is very important. Oil, natural gas and high-calorie lignite resource limitation and low production in our country should be taken into account. Lignite and domestic alternative energy sources of oil shale exploration, production and power generation projects to gain the country's economy through the implementation of the work should continue increasing.

Keywords: *Oil shale, Kerogen, Pyrolysis (Retorting), Alternative energysource*

On the Effectiveness of the Brink Hypothesis for Stellar B-Decay and Electron Capture Rates

NABI J.U¹, Calvin JOHNSON C.²

¹GIK Institute, Topi-23640, KP, Pakistan, jnabi00@gmail.com

²San Diego State University, 5500 Campanile Drive, San Diego, CA 92182-1233

The Gamow-Teller (GT) transition is one of the most important nuclear weak processes of the spin-isospin ($\sigma\tau$) type. This charge exchange transition is not only subject of interest in nuclear physics but also of great importance in astrophysics. The GT transitions are involved in many weak processes occurring in nuclei, e.g. nucleosynthesis and stellar core collapse of massive stars preceding the supernova explosion. In the early stages of the collapse, the electron capture and β -decay are important processes. These reactions are dominated by GT (and also by Fermi) transitions. Electron capture (β -decay) rates are very sensitive to the distribution of the GT+(GT-) strength. Because of the high temperatures prevailing during the presupernova and supernova phases of a massive star, there is a reasonable probability of occupation of parent excited states and the total weak interaction rates have a finite contribution from these excited states. Thus, in calculating a stellar rate, one must know the GT strength distributions of the excited states of the parent nucleus. As experimental information about excited state strength functions seems inaccessible, one is compelled to probe these strength functions theoretically. Normally stellar weak rate calculations revert to approximations known as Brink's hypothesis (in the electron capture direction) and back-resonances (in the β -decay direction). Brink's hypothesis states that GT strength distribution on excited states is identical to that from ground state, shifted only by the excitation energy of the state. GT back resonances are the states reached by the strong GT transitions in the inverse process (electron capture) built on ground and excited states.

Here we present our calculation of electron capture and β -decay rates with and without the application of Brink's hypothesis. We use shell model and QRPA model to calculate ground and excited-state GT strength functions to calculate the stellar weak rates. Our conclusion shows that relying upon Brink's hypothesis can have up to an order of magnitude effect and need not be employed in stellar weak rate calculations as done in past.

The Investigation of Vermiculite and Boron Admixtures as an Alternating Shielding Material for Gamma Rays

GULBİÇİM H.¹, TÜRKAN N.²

¹*Ondokuz Mayıs University , Samsun, Turkey,*

²*Istanbul Medeniyet University, Istanbul, Turkey, nureddin.turkan@medeniyet.edu.tr*

In this study, gamma ray shielding properties of vermiculite and boron admixtures have been investigated as a shielding material. The photon total mass attenuation coefficients μ_m , the half value layer (HVL), the tenth value layer (TVL) and the mean free path (MFP) values have been experimentally determined for the photon energies at 0.244, 0.262, 0.342, 0.600, 0.778, 1.173, 1.332, 1.408 and 1.728 MeV. The theoretical data are also calculated by using WinXCom computer code. At the end, we obtained good agreement between experimental and theoretical values. As well as the total mass attenuation coefficients, we have also calculated the effective atomic number, Z_{eff} , the effective electron number, N_{eff} , the total atomic cross-section, $\sigma_{t,a}$, the total electronic cross-section, $\sigma_{t,e}$, values for vermiculite and some building materials. Consequently, the obtained results showed that the admixtures of vermiculite and boron have signs of availability to be used as a shielding material for gamma radiation.

Keywords: *Vermiculite, Shielding, Gamma Radiation, Attenuation Coefficients.*

Source Rock Studies of the Bituminous Shales (Oil Rocks) in Sorgun (YOZGAT) Field: from the Field Of Oil and Gas in Economic Quantities Can Be Produced?

SARI A¹., MURAT A²., UĞUR F.A³., EKİNCİ M.K³

¹Ankara University Department of Geological Engineering, ali.sari@eng.ankara.edu.tr

²Turkey Coal Enterprises Authority;

³Turkish Petroleum

Sorgun (Yozgat) basic rocks in the basin consists of Paleocene age Granodiorite. Eocene sediments unconformable on basemen trocksin come. Eocene formations was deposited in the lagoon facies from bottom to top consist of conglomerate, sandstone, clay stone and marl layers. Also, one or two veins coal layer and on the approximately 43 m dark gray, with abundant organic substance, laminated, located brittle bituminous shale. Pliocene series consists of continental sediments. Unit is represented by travertine, tightly cemented conglomerates, un-cemented gravel, sandstone. After Neogene rocks are composed of alluvium.

Oil shale pyrolysis analysis was performed for 23 samples systematically collected from the Sorgun field. Bituminous shales % TOC values in the range of 2.34 to 13.08% (average 5.74 % TOC) and, in places, have excellent potential source rocks. T-max values ranged in the 428-447 ° C , it refers to those non-mature to mature kerogen. Pyrolysis data (S1, S2 hydro carbon and calculated PI data) Sorgun / Yozgat field which signifies that no organic contamination. Therefore, measured maturation values places in the basin indicate that the derived oil. 164-826 (mg HC/g TOC) the range of hydrogen index values also varies. There are different types of kerogens (Type I, Type II, Type III), however, it shows the majority of Type-I and Type-II kerogen. Kerogen types often refers to oil and gas assets. Fischer Assay analysis results (4.94% oil yield) indicate a low degree of economic bituminous rocks.

Development and the Importance of Afyonkarahisar in Geothermal Future

ULUTÜRK. Y

AFJET AŞ.,
yusufuluturk@afjet.com.tr

Energy is becoming even more important in an era where even lead to war, renewable and environmentally friendly geothermal energy is an indigenous source of energy has become more important. Turkey after countries such as Iceland and Japan are among the countries with the most important natural resources.

Afyonkarahisar is located right at the transition point in terms of the Aegean Region, the richest geothermal regions of Central Anatolia. This natural resource Afyonkarahisar regional residential heating, geothermal heating-induced green-house technology is implemented with success in many areas, such as heating and therapeutic applications of thermal and electrical energy production plants. A total of 486 MW in the town of Afyonkarahisar and is applied in various geothermal applications.

Keywords: *Geothermal regions, Thermal and electrical energy, Production plants, Central Anatolia, Afyonkarahisar*

LWR Design Impact on Radiological Source Term

USMAN S.¹, AKYUREK, T.²

¹Missouri University of Science and Technology, Nuclear Engineering Department, Rolla MO, USA, usmans@mst.edu

²Marmara University, Art & Science Faculty Physics Department, Istanbul, TURKEY, tayfun.akyurek@marmara.edu.tr

This work represents an overview of the nuclear fuel cycle from radiological/environmental impact point of view. Radiological source term from various stages of the nuclear fuel cycle will be discussed. Some example from the past nuclear events will be provided with a reference to the IAEA's international nuclear and radiological event scale. Finally the focus of the presentation will shift to the current and near future Light Water Reactor technologies from the radiological source term definition point of view. A comparison is provided for various reactors design options and the implication of these design choices on the source term. Traditionally, pressurized water reactors are considered better than the boiling water reactors because of the depth in radiological defense. Nature of fuel, namely the Low Enriched Uranium vs. MOX (Mix Oxide) for their fission products and the radiological source term is discussed. Physical form of the fuel and its impact on radiological source term will also be discussed. Likewise, the selection of cladding material will also be discussed together with the importance of coolant chemistry on the reduction of corrosion and source term.

Finally, the three levels of source term for various current LWR designs will be presented and compared with the proposed Small Modular Reactors (SMR). For level I source term, fission product inventory in the core for various design choices will be compared. Followed by level II source term discussion and its dependence on core and heat exchanger health. Finally, the waste handling systems of the current designs will be presented. It was observed that for long-lived isotopes, inclusion of volume control tank purge in PWR can reduce the concentration while for most cases, BWR fission product concentration is lower than PWR. In conclusion, traditional US Nuclear Regulatory Commission's methodologies for monitoring and Emergency Planning Zone (EPZ) will be discussed in an open form type format with audience participation.

Keywords: *Nuclear fuel cycle, Radiological source term, Nuclear accidents, Environmental protection.*

Accelerator Technologies, CERN and Turkish Accelerator Center

YAVAŞ, Ö

*Ankara University, Faculty of Engineering, Department of Engineering Physics,
Ankara, Turkey, yavas@ankara.edu.tr*

In this study, the principles and types of particle accelerators and their applications are discussed and the content of accelerator technologies are explained. The effect of these generic technologies on different fields of science and technology are given. The structure of CERN and Turkey-CERN relationships are explained and the importance of Turkey's associate membership to CERN investigated. In addition, the structure, status and statue of Turkish Accelerator Center studies are given (<http://thm.ankara.edu.tr>). In this frame, the status of first facility TARLA that is under construction is explained and the main characteristics and main parameters of proposed four big scale accelerator facilities (TURKAY, TURKSEL, TURKPRO and TURKFAB) are given together with their research potentials (<http://tarla.org.tr>). Main outcomes of third period of TAC studies are given and national and international collaboration structure are explained.

Keywords: *Particle accelerators, Accelerator technologies, CERN, Turkish Accelerator Center, TARLA facility*

ORAL PRESENTATIONS

The Origin of Eylence Yayla Pb-Zn-Cu±Au Mineralization (Kelkit-Gumushane, NE Turkey)

AKBULUT K¹, AKARYALI E.²

¹Karadeniz Technical University, Department of Geology, Trabzon, Turkey,
kubrakbulut_61@hotmail.com

²Gumushane University Department of Geology, Gumushane, Turkey, eakaryali@gmail.com

The study area including Eylence Yayla Pb-Zn-Cu±Au mineralization, which is the main subject of this study, is situated in the southern part of Gumushane city in the Eastern Pontides Orogenic Belt (NE Turkey). The area is underlain by the Kurtoğlu Metamorphic Complex that is cut by the Late Carboniferous Köse Granitoid. These basement units are covered by the Early to Middle Jurassic Şenköy Formation consisting mainly of volcanic and pyroclastic lithologies. The EylenceYayla mineralization is hosted by the volcanic rocks of the Early to Middle Jurassic Şenköy Formation. Our geochemical studies on the host rocks reveal that they are basaltic andesite in composition.

The mineralization occurs in a N20E-striking fracture zone. The main alteration types in the mineralization field are the hematitization, limonitization and sulphurization. The mineral paragenesis is pyrite, chalcopyrite, sphalerite, galena, gold, quartz and calcite. Microchemical analyses conducted on the sphalerite mineral indicate that their Zn/Cd ratios range from 83.9 to 204.1, suggesting a hydrothermal deposit associated with granitic magmas. The fluid inclusion studies reveal that the temperature was between 80 and 200 °C during the formation of the Eylence Yayla mineralization. In addition, the sulphur isotope thermometer gave an average temperature of 264 °C, supporting fluid inclusion data. The carbon and oxygen isotope results also suggest that the Eylence Yayla Pb-Zn-Cu±Au mineralization is related to a magmatic origin.

Keywords: Eastern Pontides, Fluid inclusion, Stable isotope, Lead-zinc, Gold

Geothermal Resources of Yozgat Province and Their Characteristics

AKIN G.

*Bozok University, Department of Archaeology, Yozgat,
galip.akin@bozok.edu.tr*

As a consequence of rapid population growth around the world and the development of industrialization by the last quarter of the 18th century, the demand for energy has begun to increase at that rate. The fossil fuels such as coal, oil and natural gas have been increasingly employed as energy raw materials to meet the demand. Eventually, the environmental pollution has come into question by the second half of the 20th century as a result of excessive consumption of fossil fuels. The presence of environmental pollution in the world has been accepted by everyone since the beginning of the 1970s. As alternatives of fossil fuels, it has been headed towards new energy resources which do not pollute the environment or form the least pollution concerning rapid and severe environmental pollution. These energy resources are sun, wind, sea waves and flows, tidal, nuclear and geothermal energy.

Turkey is a country with high potential of benefitting from particularly the solar energy as well as wind and geothermal energy resources. Turkey is the 5th country in the world regarding its rich geothermal energy resources with an estimated annual capacity of 31.500 MWt. A total of approximately 200 geothermal fields exist in Turkey. The geothermal resources are primarily used for residential heating, thermal tourism, power generation, industry and greenhouse farming in accordance with the temperature rate.

The province of Yozgat has a significant geothermal potential with respect to its geographic location and geological characteristics. Although the geothermal water was merely used for spa purposes in the past, it is now progressively employed in residential heating and greenhouse farming by constructing more technical and modern plants. The use and operation of geothermal resources in integrated facilities will provide an important contribution to the economy of Yozgat. The geothermal resources are employed for residential heating, thermal tourism and greenhouse farming in central Yozgat as well as the districts of Çatakboğazı, Boğazlıyan, Saraykent, Sarıkaya, Sorgun and Yerköy. On the other hand, there are geothermal fields licensed in 2011 around Aydıncık (Toraman village), Çayıralan (Söbeçimer and Bağlar location), Çekerek (Bayırhöyük and Gönülyurdu villages), Kadışehri (Hamampınarı) and Şefaati (Armağan village) districts, and in Yenifakılı district licensed in 2012.

In this literature study, having briefly described the development of energy demand in the world and in Turkey, the geothermal energy as an alternative energy supply in Turkey and the geothermal fields in Yozgat the locations and properties of wells a water temperature between 29 and 85 C° in the geothermal fields of Yozgat province as well as the types of resource utilization are explained within a framework.

Keywords: *Geothermal resource, Yozgat, Thermal tourism, Energy, Greenhouse farming*

Significance of Geotechnical Investigations during the Mining of Underground Resources

AKIN M¹, AKIN M.K²

¹*Nevşehir HacıBektaşVeli University, Turkey, mutluhanakin@nevsehir.edu.tr*

²*Abdullah Gül University, Turkey, muge.akin@agu.edu.tr*

Mining is one of the most difficult and dangerous industries in the world. Numerous fatal accidents have been recorded so far during the mining of underground resources both in the world and in our country. It is observed when the mining operations in the past is evaluated that many mining accidents occurred due to insufficient geotechnical investigations and poor modelling. An ore can be defined as a mineral with a considerable economic value formed in the earth's crust by internal and external factors. Therefore, the mass properties of mineral-bearing rocks are quite important for the mining operations. Mass failures (sliding, collapse) are highly probable in highly fractured and jointed weak rock masses as a result of erroneous design and operating techniques. On the other hand, the occurrence probability of geotechnical problems in more massive rock masses is relatively low. Mining is performed on the basis of two major methods including surface and underground mining. Sliding of rock slopes and spoil piles are the main problems in open pit mines while large scale subsidence or collapse in longwall mining constitutes a very important part of accidents in underground mining. The geotechnical investigations should be performed before the determination of slope angles and bench heights in open pit mining, thus the slopes should be designed with respect to the rock mass strength parameters. Furthermore, the groundwater condition and the drainage of subsurface water where exists is very crucial in surface mining. Projects with overestimated slope angles and bench heights as well as inappropriate drainage of groundwater in mines may lead to adverse events. A couple of successive huge landslides in Çöllolar coal-field (Afşin-Elbistan) in 2011 can be addressed as very typical examples. Additionally, the support systems and support spacing in underground mining should be designed considering the rock mass parameters with appropriate mining techniques.

Keywords: *Mine, Slope, Geotechnical investigations, Rock.*

Mars, in Term of Relations Between Undergroud Treasures and Cosmos

AKIZ H. F.

Bozok University, Yozgat, Turkey,
fulya.gencel@bozok.edu.tr

We see that mines taken out from the earth layers which are called underground treasures primarily occur in the space. One of them is iron mine. Iron mine is one of the important reason for living on the earth. But the iron mine moved into earth layers by Supernovas. In the early ages the heat generated by iron atoms via the gravity composed in the earth nucleus, caused the chemical contrasts and provide hydrosphere . The melted iron placed in the centre of earth works as a giant magnet and form the magnetic field of the earth. Through this magnetic field , Van Allen zones occurs and protects the earth's surface against the high energy cosmic radiation.

The number of iron meteorites are less than the stone meteorites on the earth. But on Planet Mars, even though the number of meteorites is less than on earth, it is obtained that the iron meteorite rate is more as against the earth. They could be seen on the surface. Because the diam of Mars nucleus is far greater against the earth nucleus. Hence, the rich land, in termes of iron oxide, and the rust are always dispersed on the surface. Because of the lack of atmosphere, meteorites are damaged barely. So they show that the asteroid zones, among the planets, are very rich in terms of the iron.

In this study, we deal with the natural sources belonging to humanity in terms of the underground treasures hang by the danger of extinction in future by using mathematical calculations.

Keywords: *Mars nucleus, Iron oxide, Iron*

Different Methods for Dead-time Determination of Nuclear Detectors

AKYUREK T.

*Marmara University, Art & Science Faculty Physics Department, Istanbul, Turkey,
tayfun.akyurek@marmara.edu.tr*

Scientists have been interested in developing a detector dead-time in radiation detectors since 1940s. In detector systems, a minimum time must separate two events so that they can be considered as different events. This minimum time is called dead-time or resolving time in a counting system. Obviously, dead-time of a detection system is not triggered by the detector but it is the total count losses from all mechanism of measurement system. Mathematically, there are two idealized models; paralyzing and non-paralyzing model. None of the detectors in the world fits these models perfectly and the reality is actually between the two models. In reality, no detector in the world can show exact counts of a radiation measurement or exact radiation dose. Therefore, radiation measurements need to be corrected using dead-time models.

In this work, dead-time of different detectors were obtained with different methods. Firstly, GM counter's dead-time value were observed under different conditions using standard two-source and the simple non-paralyzing model assumption. ^{60}Co and ^{137}Cs sources were used for two source method dead-time calculations depending on GM detector's applied voltage, operating temperature, and fatigue. At plateau region dead-time were obtained between 100 and 300 μs as typical GM counter's dead-time value provided in literature. Secondly, dead-time of N-Probe liquid scintillator detector was estimated using a combination of the attenuation law, MCNP simulation and the assumption of ideal paralyzing and non-paralyzing dead-time models. Paralyzing dead-time was calculated to be 37.6 μs and non-paralyzing dead-time was calculated to be 43.7 μs for the N-Probe fast neutron detector. Finally, dead-time value for Canberra ^3He neutron detector (0.5NH1/1K) was also calculated using a combination of subcritical assembly measurements and MCNP simulations. The paralyzing dead-time was obtained to be 14.5 μs and the non-paralyzing dead-time was calculated to be 16.4 μs for ^3He gas filled detector. These results are consistent with the dead-time values reported using two-source method for helium detectors.

Keywords: *Dead-time estimation, Paralyzing model, Non-paralyzing model, MCNP simulations*

Geochemical Investigations and Ore Potential of the Volcanites in SW Konya

ARIK F., AY B., ÖZEN Y.

Selçuk University, Konya, Turkey, farik@selcuk.edu.tr

The Erenlerdağ-Alacadağ volcanites located southwest of Konya (Turkey) has been characterized through the detailed examinations involving whole rock geochemistry and ore petrography.

The volcanites were analyzed for their major and trace element geochemical compositions. The major, trace and REE data provide information about amount of contents for volcanite and ore potential. The average compositions of the volcanites were determined according to the geochemical analyses. Average SiO₂, Al₂O₃, Fe₂O₃, MgO, CaO, Na₂O, K₂O, Cr₂O₃, Cu, Pb, Zn, Ni, Ba, Sr, Rb and Zr contents of the volcanic rocks are 59.78%, 16.64%, 5.51%, 2.61%, 5.09%, 2.87%, 3.25%, 70.83 ppm, 17.59 ppm, 4.82 ppm, 34.33 ppm, 15.45 ppm, 1221 ppm, 709.3 ppm, 108.1 ppm and 192.3 ppm, respectively.

Silicification, argillitization and FeO enrichments are usually observed on samples taken from alteration zones of volcanic rocks. SiO₂ (77.39%), Fe₂O₃ (max. 11.12%), Cr₂O₃ (25 ppm), Cu (18.67 ppm), Pb (75.88 ppm), Zn (16.83 ppm) and Zr (245.52 ppm) are more enriched in altered rocks than unaltered volcanites. Geochemical analysis indicate that the maximum content of Au values is 7.90 ppm. The maximum contents of Ag, Pb and Zn are 1.40 ppm, 317 ppm and 55 ppm, respectively.

According to ore microscopic investigations, volcanites consists of magnetite, hematite, limonite and native gold. Magnetite is usually observed in altered sections of the mafic minerals, nearby areas of the altered volcanic rocks and stream sediments. Also, few gold grains are observed in ore microscopic investigation of andesite and stream sediment samples collected from the region.

Keywords: *Geochemistry, Ore microscopy, Erenlerdağ-Alacadağ, Sw Konya, Turkey.*

Yesterday to Future - Temrezli Uranium Project

AYDIN N.

*Balıkesir University, Geological Engineering Department Balıkesir, Turkey
nasuhaydin@hotmail.com.tr*

Temrezli uranium deposit is located in Central Anatolia near Sorgun, Yozgat. The deposit is one of the large – scale uranium deposits of Turkey and has approximately 6.000 tonnes of uranium. Ore is hosted within the Eocene aged shallow marine sediments and these sediments are overlying the Cretaceous aged granites of Yozgat batholite which are considered as the main source of uranium. Uranium is dissolved and transported by meteoric water and groundwater and then concentrated in Eocene sedimentary rocks when it meets with reduced environments. Over 600 drill holes with an approximate depth of 100.000m are completed in the project area. In – situ recovery facility is planned to be constructed to produce yellow cake (U_3O_8). It is considered to sell yellow cake to new Turkish -nuclear power plants.

Keywords: *Temrezli, Yellow cake, In – situ recovery, Reduced, Eocene*

Numerical Analysis of Operating Performance of A Plate Type Heat Exchanger Used in Geothermal Applications

AYDIN, K.¹, URAL, T.², KEÇEBAŞ, A.²

¹Amasya University, Technology Faculty, Mechanical Engineering Department, Amasya, Turkey, kutay.aydin@amasya.edu.tr

²Muğla Sıtkı Koçman University, Technology Faculty, Energy Systems Engineering Department, Muğla, Turkey, alikecebas@mu.edu.tr, tolgaural@mu.edu.tr

Various problems were experienced such as incrustation, pollution, corrosion due to the chemical composition of geothermal water and according thermal performance loss, efficiency reduction, maintenance and operating costs in the machinery and equipment used on worldwide geothermal energy resources. To overcome these problems, optimized dynamic model could not be developed. But numerical and experimental studies are in progress.

The aim of this study is to investigate the optimum operating conditions of the heat exchanger to solve the aforementioned problems in plate type heat exchangers used in geothermal applications. In this context, a plate heat exchanger designed in different groove angles and different flow regimes are computer aided design (CAD) in 3D. These models were designed on computers, using AISI 316 stainless steel and titanium as a plate material used in geothermal applications and using geothermal fluid and pure water as the fluid. Thermal performance of the models were examined by computational fluid dynamics (CFD) analysis. As the result with this numerical study has provided to detection of unknowns about the optimum operating conditions of a plate heat exchanger in conditions of geothermal applications.

Keywords: Geothermal energy, Plate heat exchanger, CFD, Thermal performance, Optimization

On the Binding Energy Predictions of RMF Model with DEFNE Interaction Parameters

BAYRAM T.¹, AKKOYUN A.²

¹*Department of Nuclear Engineering, Sinop University, Sinop, Turkey, t.bayram@ymail.com*

²*Department of Physics, Cumhuriyet University, Sivas, Turkey, serkan.akkoyun@gmail.com*

We have improved new nuclear interaction parameters for non-linear Relativistic Mean Field (RMF) model by using artificial neural networks (ANN), recently. It is called DEFNE. One can expect that DEFNE interaction parameter set within the framework of RMF model can predicts various ground-state nuclear properties of nuclei such as binding energy, nuclear charge radii, deformation parameters and quadrupole moments successfully. Because of this reason, we have calculated binding energy of about 200 even-even nuclei by using RMF model with DEFNE interaction parameter set. The results have been found as in agreement with the available experimental data. Furthermore, our results have been compared with those of other non-linear RMF interaction parameter set and discussed in detail.

Keywords: *Binding energy, RMF model, ANN.*

Acknowledgments: *This work has been supported by the Scientific Research Council of Turkey (TÜBİTAK) under Project No. 115F291.*

Density Functional Study of Spin Multiplicity and Molecular Interaction Site Effect on Stability of COALB_n Clusters for n=1-7

BÖYÜKATA M., POLAT İ.

*Department of Physics, Bozok University, Tr66200, Yozgat, Turkey
mustafa.boyukata@bozok.edu.tr*

Density functional theory, at B3LYP/6-311++G(d,p) level, has been employed to optimize various structural isomers of COALB_n microclusters for each sizes up to n=7. The energetic and structural stability features of these clusters have been analyzed and Low-lying energy isomers have been predicted for these particular clusters. The main focus of this study is to investigate effects of CO interaction site and spin multiplicity on the stability of the considered clusters. Total and binding energies, HOMO-LUMO energy gaps, zero-point energies, group symmetry, nearest neighbor bond length distances and vibrational frequency values are the determined quantities. It has been observed that the spin multiplicity and the interaction site are effective on the energetically low-lying isomers and structural stabilities. The isomers having C-B interaction site are relatively more stable than those one having C-Al, O-Al and O-B for these sizes of COALB_n microclusters.

Keywords: *Cluster, Boron, Aluminium, Carbonmonoxide, DFT, B3LYP*

Investigation of Hydrogeological Properties of Denizli Basin Geothermal System (Southwestern Anatolia, Turkey)

BÜLBÜL A., ALÇİÇEK H., ALÇİÇEK M.C., YAVUZER İ.

Pamukkale University, Denizli Turkey, abulbul@pau.edu.tr

Western Anatolia (Turkey) is characterized by extensional tectonics, accompanied by low and moderate- to high-temperature geothermal fields, mainly located along the major graben bounding faults. All thermal springs (50-100°C) are closely concerned with the cooling of Neogene-Quaternary magmatic bodies and block faulting, in the western Anatolia. The presence of more than 600 hot springs with outlet temperatures (up to 100°C) reflects a significant geothermal potential in Turkey. These geothermal springs have been supported by drilling studies implemented by the General Directorate of Mineral Research and Exploration of Turkey (MTA) since the 1960s.

The Denizli Basin is 50 km wide and 70 km long, as delimited by NW- and SE-faults, located at the junction with the E-trending Büyük Menderes and the NW-trending Gediz basins. The Neogene to Quaternary sedimentary succession of the basin is up to 1300 m thick and it unconformably overlies the substratum made up of Lycian Nappe and metamorphic rocks belonging to the Menderes Massif.

Such a sedimentary succession consists of alluvial-fan, fluvial, and lacustrine deposits, described as the Denizli Group which is subdivided into four lithostratigraphic units, consisting of alluvial fan to fluvial Kızılburun (Early-early Middle Miocene), lacustrine Sazak (middle Middle-early Late Miocene), lacustrine to fluvio-lacustrine Kolankaya (middle Late Miocene-Early Pleistocene), and alluvial fan to fluvial Tosunlar (Late Pleistocene) formations.

Low-temperature geothermal fields in the Denizli Basin commonly can be seen at the eastern part (Karahayıt, Pamukkale, Kokarpınar, Ilıcapınar-Beylerli), whereas moderate-high-temperature geothermal fields (Kızıldere, Bölmekaya, Tosunlar, Yenice, Gölemezli, Babacık, Demirtaş, Karataş, Tekkehamam, Uyuz and İnaltı) are generally found on the western part of the basin.

In the Denizli Basin, two reservoir and three cap rock units were identified according to their lithological, structural, and hydrogeological characteristics. First (shallow) reservoir unit contains the lacustrine Sazak Formation (up to 300 m thick) which is a good aquifer for the thermal waters. Second (deep) reservoir unit corresponds to the Paleozoic İğdecik Formation, which is composed of quartzite, marble, and schist alternations. Similar to the first reservoir, this unit is broadly widespread in the subsurface and has a relatively high secondary porosity and permeability due to faults and fractures. Thus, this reservoir unit provides the second and main reservoir rock. In the basin, cap rocks are subdivided into two units: Tosunlar-Kolankaya and Kızılburun formations. The first cap rock is composed of Tosunlar and Kolankaya formations which cover the first reservoir Sazak Formation. The second cap rock Kızılburun Formation is located below the first upper reservoir (Sazak Formation) acting as cap rock for the second and main reservoir (İğdecik Formation) due to its well-cemented characteristics. This formation overlies the bedrock unconformably and passes upwards into the first reservoir Sazak Formation.

Heating by circulation in the high geothermal gradient setting (resulting from regional crustal thinning) controls the geothermal fluids flow through crustal damaged rocks volumes mainly represented by faults and associated fractures. All geothermal waters derive from the infiltration of rainwater through fractures and faults to the deep hot reservoir within metamorphic rocks of Menderes Massif and ascend along northern normal faults in the Denizli Basin.

Keywords: *Sw Turkey, Denizli Basin, Crustal thinning, Thermal waters, Reservoir rocks, Cap rocks*

Investigation of Morphological and Mechanical Properties of Fe-40Ni-2X (X=Mn, Si) Alloys

BÜYÜKAKKAŞ S.

Ömer Halisdemir University, Niğde, Turkey, sakkas@nigde.edu.tr, selvabuyukakkas@gmail.com

Steels are the alloys fabricated adding different elements into iron. It has been quite extensive researches on how alloying elements affect the properties of materials. In this study, we have fabricated Fe-40Ni-2X (X=Mn, Si) two alloy samples and subjected them to thermal treatment alternately at 1150 and 1200 Co for 24 h. Morphological and mechanical properties have been determined by optical microscopy (OM) and scanning electron microscope (SEM) and micro-hardness (VS) and stress-strain (SS) measurements, respectively. OM and SEM images have shown that both of these samples have austenite structure. VS measurements have revealed that the average value of hardness of the Fe40Ni-2Si sample (147,2 VSD) is greater than the Fe-40Ni-2Mn sample (119,2 VSD). In stress-strain measurements, it has been found that Fe-40Ni-2Mn sample in austenite structure should be applied to a load of 6 kN for plastic deformation. Besides, Fe-40Ni-2Si sample has exhibited elastic behaviour despite applying a load of 100 kN.

Keywords: Austenite, Vickers microhardness, Superalloys, Elastic behavior, Alloying elements

Reaction Cross–Section Calculations of the Structural Reactor Materials ^{58,60,61,62,64}Ni for Different Level Density Models

ÇAPALI V¹., ŞEKERCİ M¹., ÖZDOĞAN H¹., KAPLAN A.²

¹Süleyman Demirel University, Isparta, Turkey, velicapali@sdu.edu.tr,
mertsekerici@sdu.edu.tr, abdullahkaplan@sdu.edu.tr

²Akdeniz University, Antalya, Turkey, hasanozdogan@akdeniz.edu.tr

Nuclear reaction codes give us simplicity to investigate phenomena of nuclear physics. There exist many computer programs such as TALYS, EMPIRE, ALICE/ASH, PCROSS, FLUKA and GEANT4. The stopping power of deuteron in ^{58,60,61,62,64}Ni materials is acquired as it has helpful applications of reactor construction material and choosing the proper thickness of the target. Level density is very important to understanding nuclear reaction mechanism. The knowledge of level density for reaction cross section calculation is required for various application such as accelerator driven sub-critical systems, fission and fusion reactor design. In this study, we calculated cross sections of ^{58,60,61,62,64}Ni using TALYS 1.6 and EMPIRE 3.1 codes for different reactions through the level density models. Also, level density optimization parameters have been defined for (d,n) and (d,2n) reactions. Stopping power were calculated for deuteron, taking into consideration all possible reactions in Ni for incident energies of 0–21 MeV using GEANT4 calculation code. The obtained reaction cross–sections results have been compared with the each other and against the experimental nuclear reaction data existing in EXFOR database.

Keywords: Reaction cross section, Level density, GEANT4, Stopping power, Nickel, EXFOR

Characterizations of Ion Permeability in NavMs Channel

ÇAVUŞ M.¹, KÖRPE E.², ACAR A.O.², KUYUCAK S.³, BAŞTUĞ T.^{2,4}

¹Faculty of Education, Bozok University, Yozgat, Turkey, murat.cavus@bozok.edu.tr

²Micro and Nano Technology, TOBB ETU, Ankara, Turkey,
esrkrpe@gmail.com, aliosmanacar1897@gmail.com

³School of Physics, University of Sydney, Sydney, Australia, serdar@physics.usyd.edu.au

⁴Department of Material Science and Nanotechnology Engineering, TOBB ETU, Ankara, Turkey,
tbastug@etu.edu.tr

Voltage-gated sodium channels (Nav) are important targets for treating various diseases. Crystal structure of an open bacterial voltage-gated sodium channel (NavMS) was obtained by Ulmschneider et al recently. We used this structure in molecular dynamics simulations in order to check the stability of the channel and study hydration and coordination of sodium ions as well as their permeation mechanism. To get a better understanding of how sodium ions are conducted across the channel, we have employed free energy techniques and calculated the potential of mean force (PMF) for ion movement through the NavMs channel. The PMF results reveal the ion binding sites along the translocation pathway and provide an explanation for ion permeation in terms of the classical knock-on mechanism. We present binding energies of single and multi-ion Na⁺ to the NavMs channels. Furthermore we interpret binding energies for constructing structure-function relationship of this channel. Our results help to explain experimental data and provide insights for inhibition of Nav channels by ligands, which will be useful for the design of modern drugs targeting Nav channels.

Keywords: Sodium channel, Potential of mean force, Structure-Function relationship

Acknowledgements: This work supported by TÜBİTAK (project number: 115Z505)

Microscopical Optical Model Analysis of $^{10}\text{Be}+^{64}\text{Zn}$ Elastic Scattering System: Effectiveness of Form of Density Distribution

DİREKÇİ M.¹, BALDIK R.², BOZTOSUN İ.^{3,4}

¹Bozok University, Physics Department, Yozgat-TURKEY

²Bülent Ecevit University, Physics Department, Zonguldak-TURKEY

³Akdeniz University, Physics Department, Antalya-TURKEY

⁴Akdeniz University, Nuclear Sciences and Application Center, Antalya-TURKEY
mikaildirekci@yahoo.com

In this study, angular distribution for the elastic scattering of ^{10}Be its ground state is equally deformed but much more bound ($S_n=6.81$ MeV) than ^9Be Borromean weakly bound nucleus ($S_n=1.67$ MeV) and one neutron halo nucleus ^{11}Be ($S_n=503$ keV) on ^{64}Zn target at laboratory energy of equally 28.37 MeV have been analyzed within the Optical Model (OM) framework. Firstly, the analysis of angular distribution of this scattering system have been performed by phenomenological optical potentials using Woods-Saxon (W-S) form for real part and Woods-Saxon Square ($W-S^2$) form for imaginary part of nuclear potential. Secondly, the system has been re-analyzed by Double-Folding (DF) potential that calculated by using three different nuclear matter density distributions (NMDD) of ^{10}Be nucleus are 3p-Fermi, Gaussian and first time microscopically generated Hartree-Fock Bogoliubov (HFB) method, respectively. Comparative analysis of phenomological and microscopic optical model has been aimed and also sure that, first time we suggested phenomenologically Gaussian form and now microscopically generated HFB NMDD of that projectile and by aiming to compare three different kinds of matter density of ^{10}Be nucleus to analyze this scattering system. We observed that in microscopic OM calculations by using all 3p-Fermi, Gaussian and HFB NMDD provide very good agreement between theoretical and experimental results, with the large imaginary radius (r_w), 1.60 fm, have been obtained with small χ^2/N values.

Keywords: Deformed-bound nucleus, Optical model, Double- Folding potential, Nuclear matter Density distribution(NMDD)

Quantum Fisher Information Dynamics for LMG Model Under Decoherence

DURAN D.

Bozok University, Yozgat, Turkey, durgun.duran@bozok.edu.tr

Parameter estimation plays an important role of quantum information theory. In this field, the main task is to determine the value of an unknown parameter labeling the quantum system, and the main goal is to enhance the precision of resolution. The characterization of the estimation of the parameter is provided by the Fisher information (FI) which represents an infinitesimal distance between probability distributions and gives the ultimate precision attainable by an estimator via the Cramer-Rao bound (CRB). Its quantum counterpart, the quantum Fisher information (QFI) is related to the degree of distinguishability of a quantum state from its neighbours and gives the ultimate bound to the precision on the estimate allowed by quantum mechanics. I investigated the QFI in the ground state of collective Lipkin-Meshkov-Glick (LMG) model subjected to decoherence due to its interaction, represented by a quantum channel, with an environment and applied the techniques of local quantum estimation theory to the problem of estimating the decoherence parameter of the model. The time evolution established by system-environment interactions is assumed to be Markovian in nature and the quantum channels studied include the amplitude damping (AD), phase damping (PD), bit-flip (BF), phase-flip (PF), and bit-phase-flip (BPF) channels.

Keywords: *Quantum fisher information, LMG model, Decoherence channels, Quantum estimation.*

Extended Studies for Strontium Isotopes: Energy Levels and Half-lives

DULGER F.¹, SERT Y.², BOZTOSUN I.¹

¹Akdeniz University, Antalya, Turkey,

fatihdulger@akdeniz.edu.tr, boztosun@akdeniz.edu.tr

²Bozok University, Yozgat, Turkey, *yusuf.sert@bozok.edu.tr*

Energy levels and half-life are very important to understanding of nuclei structure. Until now, a lot of studies have been made to determine energy levels and half life for nuclei. Most of the studies, Sodium Iodide (NaI) scintillation detectors which have low energy resolution have been used. Semiconductor detectors which have high energy resolution can be used to determine energy levels, half life for nuclei and to obtain accurate and reliable results.

Determination of energy levels and half-lives of nuclei include necessary information about the nuclei-nuclei interactions, fission, fusion, transitions of electric and magnetic and production of radioisotope. First photonuclear reaction has been realized by our team in our country. With this experience, we wanted to contribute national and international literature.

We have run an experiment to determine the energy levels and half-lives of Tungsten nucleus by using the photonuclear reactions with end-point energy of 18 MeV bremsstrahlung photons, produced by a clinical linear accelerator. As a result of $^{86}\text{Sr}(\gamma, n)^{85}\text{Sr}$ and $^{84}\text{Sr}(\gamma, n)^{83}\text{Sr}$ photonuclear reactions, the energy levels and half-lives of strontium isotopes have been determined.

The results are in good agreement with the literature values.

Keywords: *Energy levels, Half life, Photonuclear reaction, Electron linear Accelerator, High purity Germanium dedector (HpGe).*

Fabrication and Characterization of $(\text{Bi}_{1-x-y}\text{Er}_x\text{Yb}_y)_2\text{O}_3$ System for Solid Oxide Fuel Cells

ERMİŞ İ.

Department of Energy Systems Engineering, Sinop University, Sinop, Turkey, 57000,
i_ermis@hotmail.com

The solid electrolyte is one of the most important components of a solid oxide fuel cell (SOFC). Various divalent or trivalent metal ion doped bismuth-based materials exhibit good ionic conductivity. Therefore, these materials are used as electrolytes in the SOFC. In this paper, the samples of $(\text{Bi}_{1-x-y}\text{Er}_x\text{Yb}_y)_2\text{O}_3$ solutions with $x= 0.205, 0.21, 0.22, 0.245, 0.25$ and $y= 0.05, 0.055, 0.06$ molar ratio are synthesized by the solid state reaction method. Detailed structural and electrical characterizations are investigated by using X-ray diffraction (XRD), AC impedance spectroscopy (EIS) and scanning electron microscopy (SEM). The XRD pattern of all samples are indexed on fcc symmetry with P21/c space group, and also Rietveld parameters are determined by using the FullProf software program. Impedance measurements of the samples are taken at 1 Hz to 20 MHz frequency range. The conductivity values of the pellets are observed to increase with increasing temperature. Based on the impedance results, it is found that grain (bulk) has contributed more than grain boundary to conductivity, permits the attribution of grain boundary. The ionic conductivity decreases with increasing amount of the Yb^{3+} contribution. The highest electrical conductivity value among all samples is measured as 0.358 S cm^{-1} at $800 \text{ }^\circ\text{C}$ for $(\text{Bi}_{0.745}\text{Er}_{0.205}\text{Yb}_{0.05})_2\text{O}_3$.

Keywords: Fuel cell, Solid electrolyte, Solid state reaction, Electrical conductivity, Activation energy.

Energy Dependence and Nuclear Energy Projects in Turkey

FURUNCU Y.

*Düzce University, Düzce Türkiye,
yfuruncu@gmail.com*

Turkey provides three fourths of the energy consumption from external sources. In 2012, energy import amount has been around 60 billion dollars and Turkey has been consuming 98% of the natural gas, 92% of the oil and 80% of the quality hard coal by import. When we evaluate this situation in respect of energy security, it is understood that it is a high risk. Developments must be made in subjects such as increasing natural gas storage capacity, improving LNG terminals and proceeding on the subject that the gas being provided from these terminals into natural gas substructure in respect of providing energy security. It is seen that conflicts and problems experienced in the geography in which Turkey is located impacts the energy security of Turkey and it is understood that this situation may have a negative influence on national security of Turkey. Because of all these reasons, actualizing nuclear energy projects are important for Turkey which is dependent in respect of energy.

In the interdependence approach of Nye and Keohane, it is seen that three column structure consisting of development of technological means, the fact that military energy not being sufficient alone today, and priority hierarchy changing in international relations has been felt in commercial and energy relations of the countries by coming into prominence in international relations. If the interdependence is disrupted, it is mentioned that the result of both parties having damages is one of the main aspects of the theory. However, it is a fact that, in both approaches, interdependence approach of the actors in the global world remain on the agenda and they are dependent to each other more.

One of the attention-grabbing points in respect of interdependence is the nuclear energy station business which is planned to be constructed in Mersin, Turkey by Russia. The fact that Turkey giving nuclear energy station project to Russia while being dependent to Russia in respect of natural gas around 60% increases the interdependence of them and manifests itself as a situation that protects the interest of both countries. It is said that if this project is interrupted, this will affect both parties negatively.

Keywords: *Interdependence, Nuclear energy, Turkey's energy strategy*

Common Underground Treasures of Anatolian Civilizations in the 2nd Millennium BS

KAHRAMAN ÇİNAR A., ŞİMŞEK F.

Bozok University, Yozgat, Turkey, asli.kahraman@bozok.edu.tr
Atatürk University, Erzurum, Turkey, fitnatsimse@gmail.com.tr

In the 2nd Millennium BS, it is known that the large part of Anatolia and the north of Syria were controlled by Hittites. Hittites formed an advanced civilization in numerous fields four thousands year ago. Their strategies, novelties, inventions on political, military and financial areas remain their mystries even today. They broke new grounds on economics. Underground and over ground treasures contributed to their economics. In Hittites geography, it is seen that they both used these underground and over ground resources as a raw material and then exported and produced Daily articles by crafting. Also these treasures was an important source for military supplies. Iron, silver, lead zinc, copper whose names are o the cuneiform tablets, are very important in the sense of both their mineral stratums and processings. In the conditions of that period, the success of bronze industry are seen on bronze items extant. The skill of processing shows us that the art of mine processing was advanced. The items of the art of mine processing brought to light by archeological researches, are shown today in the museum of several places of Anatolia.

In this study it is stated of mines and their usage areas which were taken out in Hittites geography and civilizations which gave export materials from Hittites. Also it is informed of four thousands ago mining of today's Anatolia.

Keywords: *Hittite, Ancient time, Metallurgy*

Second Law Analysis of an Adsorption Air-Conditioning System

KARA O., HÜRDOĞAN E., BÜYÜKALACA O.

*Osmaniye Korkut Ata University Energy Systems Engineering, 80000, Osmaniye, Turkey,
osmankara@osmaniye.edu.tr, ehurdogan@osmaniye.edu.tr, obuyukalaca@osmaniye.edu.tr*

Air conditioning systems are designed to improve people's living standards and provide comfort. The use of this system brings together with environmental problems, energy consumption and costs. These problems can be reduced by making studies on energy efficiency and saving in air conditioning systems. Adsorption (dehumidification, desiccant) air conditioning systems, which have widely being used in recent years, can be evaluated in terms of energy efficiency. In this study, a desiccant based air-conditioning system was considered to evaluate the system performance by using second law analysis (exergy analysis) for Yozgat province. Psychometric properties for each state and system performance parameters were calculated using Engineering Equation Solver (EES). It was found from the results that maximum exergy destruction occurs in electric heater unit and the total exergy destruction of the system is 24.66 kW. It was also found that the exergy efficiency of this system is 19.87 %. The results showed that this system can be used for air conditioning in Yozgat climate conditions and the performance of the system can be increased by using waste heat or renewable energy resources for regeneration heat.

Keywords: *Air conditioning, Second law analysis, exergy, irreversibility*

Producing Gas from Coal and Using in Energy

KOCAMAN R.¹, BOZTAŞ S.C.², KOCAMAN B.¹

¹MİGEM, Ankara, Turkey,

rkocaman074@hotmail.com, bkocaman74@gmail.com

²Danışmanlık Hizmetleri, Ankara, Türkiye,

serdarcem@gmail.com

The demand to the energy continues increasingly today. The demand to the energy has push people to search new resource. It is obvious that coal will be the energy resource in the coming period too as it is today despite there are alternative energy resources like hydraulic, sun, nuclear in our country. The conversion to the energy by getting gas from coal is one of the new alternate energy resources. To use domestic energy resources carries another importance for our country. One of these domestic resources is our coal reserves. Getting energy by coal gas is being applied successfully in abroad for long years. The researchs has been started recently in our country. The well studys in Amasra and Azdavay are being continue. The conversion of the obtained gas to caloric and energy will become as get energy from domestic resources and also as a new energy process by increasing variety in energy production. Surface made of coal gasification, methane in coal mines and related problems by preventing the production of gas can be used as an energy The gas will be used as a energy resource by avoiding the problems cused by methane gas in coal mines with production of gas. It is evaluation to be informed by evaluating the studys in our country as obtaining coal gas applications in the world, comparing with the other energy resources, the gains and negative sides of obtaining gas from coal, the place of coal gas in the energy production and converting to the energy in this study. supporting projects to investigate the origin of coal gas for our country is trying to attract attention.

Keywords: *Coal, Gas, Energy, Gas drill*

Biomarker Characteristics of Low Organic Carbon Coal: Yatağan Coal Occurrences (Denizli/SW Turkey)

KORALAY D.B.

*Pamukkale University, Denizli, Turkey,
dbkoralay@pau.edu.tr*

The study material, which is organically rich sediments, is from Yatağan locality, which is situated as a part of Serinhisar country almost 45 km on the southeast of Denizli. coal with low organic content from the study field is located in units which show terrestrial and lacustrine features and their expansion and thickness is slight. The units called Yatağan Formation are composed of two different lithologies that are formed by clastic and carbonate rocks. While clastic rocks are composed of pebble stone, sandstone, siltstone and claystone, carbonate rocks are composed of limestone, argillaceous limestone, marl and claystone. Coal with low organic carbon content, which is among limestone, argillaceous limestone, marl and claystone from Yatağan Formation, is gray, brown and black in colour with leaf-like structure, quite fragile and shows lamination feature. Also, plant and tree parts are observed within layers. The purpose of this study is to find out the origins of the organic materials in the samples, the maturation level of the organic materials and information about the sedimentary environment by an interpretation of the biomarker parameters of coal with low organic carbon content.

Two calibrated stratigraphical sections with thicknesses of 60 m and 6.05 m are taken from the locality where Yatağan Formation exposes and total organic carbon (TOC)/Rock Eval pyrolysis analysis is applied to 20 coal samples. The TOC values of the examined samples are between 0.59 % and 48.30 % and they have the source rock potential within an interval from middle to perfect degree. Thin layer chromatography (TLC/FID), gas chromatography (GC) and gas chromatography - mass spectrometry (GC-MS) analyses of the three samples from the study field are applied. The extract amounts of the examined samples are between 8016 ppm and 19965 ppm. Hydrocarbon groups are determined according to their percentage amounts; polar + asphaltens between 73.21% - 98.7%, saturate hydrocarbons between 21.87 % - 1.09 % and aromatic hydrocarbons between 7.71% - 0.21%. The n-alkane dispersions of the low organic carbon coal can be used to find out the origins of the organic materials. The n-alkane dispersions of the examined samples are within the interval of n-C₁₅ and n-C₃₅. Additionally, the dominance of the odd numbered n-alkanes like n-C₂₇, n-C₂₉ and n-C₃₁ can be interpreted with the abundance of highly terrestrial plants. Also, parameters like quite high ratios of $\Sigma(nC_{21}-nC_{31})/\Sigma(nC_{15}-nC_{20})$, high carbon preference index (CPI) and high terrigenous/aquatic ratio (TAR), the lack of tricyclic terpanes as dominant peaks, the existence of C₂₉Ts component, C₂₉Ts/C₂₉Ts + norhopan ratio and the high level of C₂₉sterane ratio indicate the presence of organic materials originated from highly terrestrial plants. High moretane/hopane ratio and quite low Ts percentage and Ts/Ts+Tm ratio show thermally immature organic materials.

Keywords: *Denizli coals, TOC, Terrestrial organic matter, Biomarker*

Acknowledgement: *This study was supported by TÜBİTAK 114Y668. The author would also like to thank Assoc. Prof. Dr. Tamer KORALAY for his help during the fieldwork.*

Using Measure Corralate Predict Methods to Calculate Wind Energy Potential, and an Utilization in Karabuk

KÖSE B.¹, GÜNEŞER M.T.², RECEBLİ Z.³

¹Department of Energy Systems Engineering, Technology Faculty, Karabuk University, Karabuk, bayramkose@karabuk.edu.tr

²Department of Electrical-Electronics Engineering, Engineering Faculty, Karabuk University, Karabuk, Turkey, mtguneser@karabuk.edu.tr

³Department of Energy Systems Engineering, Technology Faculty, Karabuk University, Karabuk, zrecebli@karabuk.edu.tr

The measurement correlation predicts (MCP) methods can be used particularly to predict the outputs of the mathematical functions, which are non-periodical but changing in a gap close to a mean value. So, MCP methods are expected to be rewarding calculating wind energy predicts, in particular calculating wind potential, determining the accuracy of the measurements and completing missed data.

In this study, we evaluated related correlations of some MCP methods in the literature and wind energy potential calculation utilities and precisions of calculation results.

Additionally; the measurement results of the provinces Bolu, Zonguldak, Bartın, Kastamonu and Karabuk from West-South Black Sea Region were compared with the outputs of mentioned MCP methods. It was proved that, all of applied MCP methods are sensitive to the values changing because of climate changes, the dependency restricted between reference and candidate regions, the data frequency using for model calculations and the measurements for representing characteristics of long term winds.

Also it was obtained that MCP methods are useful to improve measurements, which have to be done in a limited time.

Finally, an application was surveyed on missing data of Karabuk, to prove performances of MCP methods and missing data completed with high accuracy.

Keywords: *Wind energy potential, Measure-correlate-predict(MCP) methods, Complement data, accuracy of the measurement data, Hourly mean wind speed.*

Investigation of Gold Deposits Related to Alteration with Radiometric Method: Arzular (Gümüşhane) Area

MADEN N.¹, AKARYALI E.²

¹Gümüşhane University Geological Engineering Department, Gümüşhane, Turkey,
nmeden@gumushane.edu.tr

²Gümüşhane University Geophysical Engineering Department, Gümüşhane, Turkey,
eakaryali@gmail.com

Potassium is generally the most useful pathfinder element for gold mineralization zones because of its increase in altered rock surrounding the deposits. In this study, radiometric data such as potassium (%K), equivalent thorium (eTh ppm) and equivalent uranium (eU ppm) as well as K/eTh and K/eU ratio maps were utilized in order to recognize favorable mineralization zone. In Geophysics, the radiometric method has been widely used in geological mapping, mineral exploration and environmental radiation monitoring. The Arzular mineralization site is one of the best examples of epithermal gold deposits located in southern zone of the eastern Pontides orogenic belt. The distribution of K, eU and eTh concentrations for the study area are observed from 0.0 to 5.9 % with a median value of 2.9 %, 0.5 to 3.2 ppm with a median value of 0.9 ppm and 0.01 to 8.17 ppm with a median value of 1.3 ppm, respectively. Obtained results showed that gold mineralization related to alteration is associated with an increase in potassium and decreases in uranium and thorium due to adularia and sericite in the study area.

Keywords: Radiometric method, Gold mineralization, Potassium Enrichment

Determination of the Genesis of Eocene Volcanics in the Borçka (Artvin, NE Türkiye) Area with Gamma Ray Spectrometer

MADEN N.¹, AKARYALI E.², AYDINÇAKIR E.²

¹Gümüşhane University Geological Engineering Department, Gümüşhane, Turkey,
nmaden@gumushane.edu.tr

²Gümüşhane University Geophysical Engineering Department, Gümüşhane, Turkey,
eakaryali@gmail.com

The gamma ray spectrometry method has been widely used in geological mapping, mineral exploration, environmental radiation investigation, Archeogeophysics applications, and soil moisture evaluations. This method involves the measurement of naturally occurring radioactive elements, uranium (U), thorium (Th) and potassium (K) for the top of the Earth's surface, that exist in rock forming minerals. To determine the genesis of the Tertiary volcanics exposed in the Artvin-Borçka in the Eastern Pontides Orogenic belt, the Uranium (U, ppm), Thorium (Th, ppm) and Potassium (K, %) concentrations of the rocks are measured with the gamma ray spectrometer method. The Eastern Pontides orogenic belt, which includes the study region, essentially formed as a result of the left lateral movement of the Arabian-African plates with respect to Eurasian Plate and opening of the Atlantic Ocean within the Alpine –Himalayan system. The average K, U and Th values for the study area are observed as 0.89 %, 1.29 ppm, ve 2.49 ppm, respectively. The region is represented by a very high concentrations of U/Th value ranging from 0.11 to 3.14 with mean value of 0.71, which is fairly higher than the depleted upper mantle. All our evidences support the conclusion that the parental magma of the rocks probably derived from an enriched mantle, previously metasomatized by fluids derived from subducted.

Keywords: Gamma ray spectrometer, Eastern Pontides, U-Th-K, Volcanic rocks

Acknowledgement: This work was supported by The Scientific and Technological Research Council of Turkey (TUBITAK), Turkey, Project No: 115Y729.

Stable Isotope Studies ($\delta^{18}\text{O}$ and $\delta^{13}\text{C}$) on W-Skarn Mineralization Associated with Topuk Pluton (Bursa, Western Anatolia, Turkey)

ORHAN A.¹, MUTLU H.²

¹*Nevşehir Hacı Bektaş Veli University, Department of Geological Engineering, 50300, Nevşehir, Turkey, ayse.orhan@nevsehir.edu.tr*

²*Ankara University, Department of Geological Engineering, 06100, Ankara, Turkey, halimmutlu@ankara.edu.tr*

NW-skarn deposits are subdivided into “reduced” and “oxidized” types based upon their pressure, temperature and oxidized conditions. In the early (prograde) stage reduced type deposits with economical significance are characterized by ferrous (hedenbergite, grossular, etc.) minerals, while the oxidized type deposits are dominated by ferric (diopside, andradite, etc.) minerals. Economic scheelite grade during the late (retrograde) stage in both types W-skarn system is determined to increase with increasing rock-fluid ratios (20 to 40).

Kozbudaklar scheelite skarn deposit is located approximately 22 km southeast of Bursa, at south of the İzmir-Ankara Suture zone. Skarn zone occurs at the contact between Eocene Topuk Pluton and Triassic İnönü Marble. Four stages have been defined through skarn evolution. The early stage that is represented by similar anhydrous minerals is recognized as two subgroups on the basis of minerals paragenesis and compositions. In stage I, garnet + clinopyroxene ± wollastonite ± plagioclase ± scheelite ± sphene ± pyrrhotite ± apatite minerals are developed. The stage II consists of garnet + clinopyroxene ± vesuvianite ± plagioclase ± scheelite ± sphene ± apatite minerals. In stage I and II at which scheelite mineralization occurs hedenbergite ($\text{Hd}_{61-96}\text{Joh}_{4-7}$), calcic garnet ($\text{Grs}_{38-94}\text{Sps}_{1-5}\text{Alm}_0$), scheelite (Pow_{1-6}), labradorite (An_{55-64}) and diopside ($\text{Hd}_{16-48}\text{Joh}_{0-9}$), subcalcic garnet ($\text{Grs}_{24-92}\text{Sps}_{0-11}\text{Alm}_{0-31}$), Mo-rich scheelite (Pow_{7-32}) and anorthite (An_{91-100}) represent moderately oxidized-oxidized conditions. In stage III with a slight retrograde character is represented by quartz ± calcite ± chlorite ± vesuvianite ± epidote ± pyrite ± chalcopyrite ± magnetite whereas the stage IV which is as defined as post-skarn stage consists of quartz ± calcite.

According stable isotope compositions, temperature-dependent $\delta^{18}\text{O}$ fluid (8.3 to 10.5‰ (VSMOW)) and δD fluid (-50.1 to -62.7‰ (VSMOW)) values for the Topuk Pluton indicate unaltered I-type granites. $\delta^{13}\text{C}$ (3.90 to 5.20‰ (VPDB)) and $\delta^{18}\text{O}$ (21.10 to 24.676‰ (VSMOW)) values of İnönü Marble characterize a marine origin. $\delta^{18}\text{O}$ fluid values vary from 6.4 to 10.7‰ for stage I, 3.0 to 14.0‰ for stage II, -4.97 to 5.9‰ for stage III and -5.7 to 0.3‰ for stage IV. Results of oxygen isotopes indicate that magmatic, magmatic-meteoric-metamorphic, magmatic-meteoric and meteoric fluids are dominant in the respective stages. In skarn calcites, for the stage III $\delta^{13}\text{C}$: 1.10 to -0.70‰ and $\delta^{18}\text{O}$: 7.32 to 10.82‰ and for stage IV $\delta^{13}\text{C}$: 0.0 to -3.3‰ and $\delta^{18}\text{O}$: 3.93 to 7.61‰ indicating systematic depletion in $\delta^{13}\text{C}$ and $\delta^{18}\text{O}$ values as a result of magmatic and meteoric fluid infiltration. Results of stable isotopes for the Kozbudaklar skarn deposit indicate that during the skarn forming process meteoric water infiltrated at varying oxidant conditions and scheelite failed to reach an economic size with low rock-fluid ratios (3-10) during the retrograde (III) stage.

Keywords: Scheelite mineralization, Stable isotope, Rock-fluid ratio, Topuk Pluton, Western Anatolia, Turkey.

Acknowledgement: This study was supported by the Scientific and Technical Research Council of Turkey (TÜBİTAK; YDABAG-111Y289).

The Thermal Examination of Fibreglasses Application for Heat Recovery Tanks

ÖZDEMİR M.¹, ÖKTEN K.²

¹*Sakarya University, Engineering Faculty, Mechanical Engineering Department, Sakarya, Turkey, mozdemir@sakarya.edu.tr*

²*Amasya University, Technology Faculty, Mechanical Engineering Department, Amasya, Turkey, korhan.okten@amasya.edu.tr*

Today, there is a significant increment in energy consumption in parallel with development of technology. To supply the consumption, dependency on fossil fuels have increased and emissions, which occur with used fossil fuels, create greenhouse effect and cause global warming. When literatures are examined, generally, it is emphasized using renewable energy sources such as wind and solar energy. Besides, maximum efficiency obtained from produced energy, plays significant role in literature. . In order to use energy efficiently, waste heat and solar energy, renewable energy sources which exist only for a certain period of time, should be stored. For this, water, which has a high thermal capacity, is commonly used as storage mass. Density of the water varies depending upon temperature. Therefore, the water of which temperature vary in the course of heating and cooling, is exposed to convections currents in the storage and accelerates its heat transfer. Even though this may seem advantageous at first, as the temperature gradient is decrease due to heat exchange, the heat recovery from the storage occurs at lower temperatures.

This study aims to prevent convections currents and to obtain covered heat at higher temperature. Therefore, fibreglass impregnated with water is used as tank equipment. According to the results, fibreglass impregnated with water acts like a solid body. This situation provided that heat retrieves from thermal tank with fibreglass at higher temperatures than thermal tank without fibreglass. However, it was observed that there is a decreasing in the amount of stored energy, and the heat transfer rate decelerates.

Keywords: *Heat transfer, Thermal energy storage, Convection, Thermal stratification*

New Type Gels for Dye Sensitized Solar Cells

ÖNEN T.¹, ÖZBAY KARAKUŞ M.², COŞKUN R.³, EREN YAKIŞIKLIER M.¹, ÇETİN H.¹

¹Bozok University, Art & Science Faculty, Department of Physics, Yozgat 66900, Turkey

²Bozok University, Engineering and Architecture Faculty, Department of Computer Engineering,
Yozgat 66900, Turkey

³Bozok University, Art & Science Faculty, Department of Chemistry, Yozgat 66900, Turkey
hidayet.cetin@bozok.edu.tr

In this work, newly synthesized gels were used as gel electrolyte to solve the liquid electrolyte problem at Dye Sensitized Solar Cells (DSSC). For this purpose, DSSCs were fabricated with Black Mulberry sensitizer. Seven DSSCs were fabricated. Then, one of them was prepared with conventional iodine electrolyte. The others were prepared with iodine electrolyte adsorbed Poly (2- acrylamide- 2- methyl propan sulfonic acid (itaconic acid/ N.N'methylene bis acrylamide (Poly-AMPS-IA) is synthesized and then Aniline (An) Fluorine-Aniline (F-An), Bromide-Aniline (Br-An), Chlorine-Aniline (Cl-An) and Fluorine-Chlorine-Bromide-Aniline (F-Cl-Br-An) doped derivatives are prepared. Solar cell parameters (efficiency, fill factor etc.) were investigated in terms of electrical stability of the DSSCs for 150 days. It was found that DSSCs with above mentioned gels show stable electrical characteristic even for 150 days while solar cell was liquid electrolyte showed worsened performance. Furthermore, an improvement has been observed at solar cell energy conversion efficiency with the values of 2.62- fold for Poly (AMPS-IA/F-Cl-Br-An), 2.23-fold for AMPS-IA, 1.69-fold for AMPS-IA/An, 1.62-fold for AMPS-IA/Cl-An and 1.46 AMPS-IA/F-An, AMPS-IA/Br-An, when these solar cells have been compared to the liquid electrolyte used solar cell.

Keywords: *Dye sensitized solar cell, Gel electrolyte, Polymer gel*

Energy Security in the Power Axis and Reflections on The Stability

ÖZALP M.

Bozok University, Faculty of Economics and Administrative Sciences; Department of Economics, Economic Development and International Economics, Yozgat, Turkey, mustafa.ozalp@bozok.edu.tr

How much water is needed for people's daily life, energy is very necessary and important to technologically develop, to grow, for the states. Because the energy has a necessary place on the humanity of daily life for heating, housing, food, drinks, clothing. Since the end of the 19th hundred years, the states have tried to shape the limits of their foreign policy and most of their colonial territories depending on their energy needs. For the sake of energy, many states have been destabilized and occupied. Maps of the many states have been drawn again. Before II. World War, Britain's prime minister, Winston Churchill also said that a drop of blood was more valuable than a drop of oil. In 21st Century, it has been focused on the concept power that is produced on the energy policies such as energy, security of energy supply and demand, energy pipelines and energy dependence.

Every state uses this power for the sake of their own benefits as a political, economic, social and cultural gun. It is very important for a state to supply security of energy supply/demand and to turn in their own favor of the energy pipelines where passes their own land. Otherwise states use energy and pipelines against to each other like a blackmail in international relationships. According to data of the Eurostat that is European statistical agency, European states have provided 39 percent of all imported gases, 33 percent of all imported oil from Russia. Most amount of this imported gas and oil that is taken from Russia, have been passing throughout Ukraine. In the past, as it is known, some severe gas crises have emerged between European countries and Russia because Ukraine is an important transit country. And at most time of these crises, Russia stopped gas run for European countries. We saw how the energy was used as a threatening element and how that was affected the state stability when Russia annexed Crimea in the early of 2014. At the result of Crimean annexation, Ukraine lost land. European countries met gas shortage in the middle of the winter. On the other hand, turning Russia crises into an opportunity, Turkey and European countries couldn't be successful on the topic of making Turkish transit pipeline building. European countries import 50 percent of all needed gases that is consuming. This import rate will reach 70 percent in 2020 and 85 percent in 2030. On the other hand, Gazprom's contract that was made with big EU consumers will finish until 2021. Not only Turkey is neighbor with Central Asia-Caspian region (including Russia), Middle East where are 70 percent of all world energy reserve but also, it is a poor country in the point of energy reserve and a transit country next to European importing a high amount of energy. That is why, in the following years, Turkey's geostrategic and geopolitical position will play a fundamental role about determining the relationship of the power-stability that will be formed on the axis of regionally and globally between the states.

Keywords: *Energy security, Power, Stability and energy pipelines*

Dyes Extracted from Pelargonium Flowers: A Solar Cell Application and Dyes Ingredients Analysis Study

ÖZBAY KARAKUŞ M.¹, KOCA İ.², KOCA A.³, ER O.⁴, ÇETİN H.⁵

¹Bozok University, Engineering and Architecture Faculty, Department of Computer Engineering

²Bozok University, Art and Science Faculty, Department of Chemistry

³Marmara University, Engineering Faculty, Department of Chemical Engineering

⁴Bozok University, Engineering and Architecture Faculty, Department of Electrical and Electronics Engineering

⁵Bozok University, Art and Science Faculty, Department of Physics, hidayet.cetin@bozok.edu.tr

In this work, dye sensitized solar cells made from natural dyes extracted from Pelargonium Grandiflorum and Pelargonium Hortorum were investigated for natural-dye solar cell application. Firstly, ingredients of the two dyes were obtained from GCMS analysis. According to the analysis results, while 13.5% Gallic Acid were found in the Pelargonium Grandiflorum dye, it is 65.7 % in the Pelargonium Hortorum dye. When the two solar cell were fabricated from the dyes, it was observed that the solar cell made from Pelargonium Grandiflorum had higher energy conversion efficiency. Thus, it was found a relationship between the quantity of gallic acid and energy conversion efficiency. The electrical characterizations of fabricated solar cells were measured under 1000 W/m² light intensity by using a halogen lamp. Short circuit current, fill factor values were obtained as 1.34 A/m², 0.594 for Pelargonium Grandiflorum and 0.73 A/m², 0.581 for Pelargonium Hortorum. Furthermore, HOMO-LUMO level values of the dyes were obtained from Cyclic Voltammetry. HOMO and LUMO energy levels and energy gaps were derived from the onset potentials of the first reduction and first oxidation processes of the dyes. These values were found as -0.10 V, 0.88 V and 0.98 V vs. NHE for Pelargonium Grandiflorum and were -0.14 V, 0.91 V and 1.05 V vs. NHE for Pelargonium Hortorum, respectively.

Keywords: Dye sensitized solar cell, Natural dyes, Pelargonium

Acknowledgment: This study has been supported by Bozok University Scientific Research Projects Department for 2014-FBE/T143 coded project.

Numerical Modeling of Large Scale Ground Coupled Heat Exchanger, Performance Evaluation and Sustainability

OZDOGAN-DOLCEK A.¹, TINJUM J.M.²

¹Balıkesir University, Balıkesir, Turkey, aozdogan@wisc.edu

²University of Wisconsin, Madison, USA, jmtinjum@wisc.edu

This study examines the sustainability of an operating, district-scale cooling dominated geothermal borefield in the upper Midwest, is a region in the northern portion of the US. Computational fluid dynamics (CFD) implemented with the finite volume method is used to simulate the borefield-scale temperature responses to design heating and cooling loads. The presented numerical method considers the borefield's interaction with the surrounding ground formation, which occurs through transient thermal conduction coupled with advective heat transfer from groundwater flow. The results show that significant energy imbalances (i.e., overheating) will develop in the ground even after the first few years of ground-coupled heat exchange (GCHE) operation.

This energy imbalance causes a decrease in efficiency and may cause unsustainable GCHE application for the next heating and cooling cycle. The presented study also evaluates the system's performance by modeling a single borehole GCHE system and estimating the coefficient of performance (COP) of the heat pump based on the temperature of fluid entering the heat pump. To balance the energy inputs/outputs to the ground, mitigation strategy, which is an operating scheme utilizing cold-water circulation during the winter, is evaluated. Under the simulated conditions, the energy balance is achieved; thus, the proposed mitigation strategy may be a viable measure to sustain the operating efficiency of cooling dominant, district-scale borefields in climates with cold winters over the long-term.

Keywords: *Ground couple heat pump, Ground couple heat exchanger, Computational fluid dynamics (cfd), Groundwater flow, Heat mitigation.*

Geochemical, Fluid Inclusion and Isotopic (S, O, Pb) Investigations of Pınarbaşı Pb-Zn Mineralization (Gediz-KÜTAHYA) NW Turkey

ÖZEN Y. and ARIK F.

Selçuk University, Konya, Turkey, ybozkir@selcuk.edu.tr

The Pınarbaşı Pb-Zn mineralization is located in the western part of Anatolian tectonic belt, in southern part of the İzmir-Ankara zone and in northern part of the Menderes Massif. The ore mineralization located approximately 7 km northwest of Gediz (Kütahya-Turkey) has been characterized through the detailed examinations including ore mineralogy, geochemistry, fluid inclusion, stable and lead isotope geochemistry.

The Pınarbaşı Pb-Zn mineralization is observed mainly through the fault between Pınarbaşı granitoid and Dağardı ophiolitic mélange. The main ore minerals are galena, sphalerite, chalcopyrite, pyrite, W and fahlerz group (tennantite, tetrahedrite-fraibergite) minerals and they are accompanied by cerussite, digenite, chalcocite, covellite, bornite, smithsonite, anglesite, malachite, orpiment, Fe-oxide, gangue quartz, and calcite.

In addition to Pb, Zn and Cu, ore samples contain substantial quantities of Sb, As, Co, Cd, Bi, Ba, Sr, Ni, Zr, Ag, and Se. Maximum contents for the following elements in analyzed ore samples are Pb (8.37%), Zn (3.18%), Cu (1.25%), As (2359 ppm), Co (109.3 ppm), Bi (1009 ppm), Ba (5668 ppm), Sr (339 ppm), Ni (2208 ppm), Zr (99.7 ppm), Cd (117.4 ppm), Sb (4500 ppm), Ag (96.4 ppm), and Se (151 ppm).

The $\delta^{34}\text{S}$ values for pyrite and galena formed in the same stage vary in the range from -4.2 to -0.5 ‰ (average -2.6 ‰) and -4.0 to -3.3 ‰ (average -3.7 ‰), respectively. $\delta^{34}\text{S}$ values of pyrite and galena for H_2S , representing the composition of the fluids responsible for the sulfide mineral formations and calculated from the $\delta_{34}\text{S}$ values are between -5.17 and -1.47 ‰ (average -3.5 ‰) and -2.47 and -1.77 ‰ (average -2.1 ‰), respectively. $\delta^{18}\text{O}_{\text{V-PDB-Calcite}}$ values range from -12.5 to -20.1 ‰ and calculated $\delta^{18}\text{O}_{\text{V-SMOW-Calcite}}$ values range from -10.2 to 18.0 ‰.

Lead isotope data for galena from the Pınarbaşı Pb-Zn-Cu mineralization are yield $^{206}\text{Pb}/^{204}\text{Pb}$ values of 18.919-18.924, $^{207}\text{Pb}/^{204}\text{Pb}$ values of 15.707-15.711, and $^{208}\text{Pb}/^{204}\text{Pb}$ values of 39.035-39.042.

Fluid inclusion studies on calcite and sphalerite of the same silicification stage collected from the mineralized vein indicate that the homogenization temperature of the fluids range from 302°C up to 370°C and 359°C, respectively. The salinities of the inclusions observed in calcite and sphalerite are between 7.86 and 4.49 wt. % NaCl eq. and 4.96 wt. % NaCl, respectively.

The stable (S, O) and lead isotope geochemistry combined with paragenetic relationships and microthermometric data suggest the presence of prevailing magmatic hydrothermal component within the ore-forming fluids. Considering this aspect with the geological features, the possibility that the mineralization was genetically related to Pınarbaşı granitoid.

Keywords: Geochemistry, Stable isotope, Lead isotope, Fluid inclusion, Pınarbaşı, Kütahya, NW Turkey.

Acknowledgements: This study covers a part of the research project which supported the financially by Selçuk University-Scientific Research Project (BAP) Coordinatory (BAP Project No: 09401059).

Genetic Relationship of Polymetallic Hydrothermal Değirmenciler Sb, İnkaya Cu-Pb-Zn-(Ag) and Arpaçukuru Fe-Cu Mineralizations in Simav (Kütahya-NW Turkey)

ÖZEN Y. and ARIK F.

Selçuk University, Konya, Turkey, ybozkir@selcuk.edu.tr

Several mineralizations formed in association with a tectono-magmatic period occur along the Simav Graben. Large number of hydrothermal mineralizations such as Değirmenciler Sb mineralization, İnkaya Cu-Pb-Zn-(Ag) mineralization and Arpaçukuru Fe-Cu mineralization are also observed along the tectonically active Simav Graben. Precambrian Kalkan Formation represented by biotite-gneiss is cut by Arpaçukuru granite porphyry. The Arpaçukuru Fe-Cu mineralization located in fissures and fractures of Arpaçukuru granite porphyry. The Arpaçukuru mineralization consists of magnetite, pyrite, murchisonite, chalcocite, arsenopyrite and Fe-oxide minerals. Calculated $\delta^{34}\text{S}$ values for H_2S , representing the composition of the fluids responsible for the sulfide mineral formations and are between -1.67 and -6.87 ‰. $\delta^{18}\text{O}_{\text{quartz}}$ values in Arpaçukuru mineralization range from 11.9 to 12.8 ‰ and estimated $\delta^{18}\text{O}_{\text{fluid}}$ values range from 7.9 to 8.8 ‰. $\delta^{18}\text{O}_{\text{magnetite}}$ value is 2.0 ‰ and estimated $\delta^{18}\text{O}_{\text{fluid}}$ value is 8.7 ‰.

The İnkaya Cu-Pb-Zn-(Ag) mineralization is located along an E-W-trending fault in the Cambrian Simav Metamorphics, which consist of quartz-muscovite schist, quartz-biotite schist, muscovite schist, biotite schist, and the Arıkayası Formation, which is composed of marbles. In İnkaya mineralization consisting of galena, sphalerite, chalcocite, pyrite and fahlore and small amounts of cerussite, anglesite, digenite, enargite, chalcocite, covellite, bornite, and Fe-oxides, calculated $\delta^{34}\text{S}$ values for H_2S of galena, chalcocite and pyrite are between -0.02 to -0.3 ‰, 0.26 to 0.46 ‰, -2.77 to 1.33 ‰, respectively. $\delta^{18}\text{O}_{\text{quartz}}$ values in İnkaya mineralization range from 11.3 to 16.4 ‰ and estimated $\delta^{18}\text{O}_{\text{fluid}}$ values range from 5.4 to 10.6 ‰.

The Değirmenciler Sb mineralization is a typical example of the epithermal mineralization occurring in the Menderes Massif (Kalkan formation, Simav metamorphics, Sarıcasu formation and Arıkayası formation) cropped out in the Western Anatolia. The Değirmenciler Sb mineralization consisting of antimonite, pyrite, chalcocite and small amounts of valentinite/senarmontite occurred along the E-W trending faults in the final step of formation of the Simav Graben. $\delta^{34}\text{S}$ values of antimonite and pyrite for H_2S are between 4.44 and 5.74 ‰, -15.07 and -10.57 ‰, respectively. $\delta^{18}\text{O}_{\text{quartz}}$ values range from 4.6 to 30.3 ‰ and $\delta^{18}\text{O}_{\text{fluid}}$ values range from -3.7 to 22.0 ‰.

Fluid inclusion studies on quartz collected from the mineralized vein in Arpaçukuru, İnkaya and Değirmenciler mineralizations indicate that the temperature range of the fluids are 432°C to 320°C, 340°C to 235°C and 266°C to 162°C and that the salinities are 0.7 to 4.49 wt. % NaCl, 4.49 to 7.6 wt. % NaCl and 7.59 to 18.47 wt. % NaCl. Sulfur and oxygen isotope values for three mineralization mentioned above are similar to the values for magmatic rocks and to the values for fluids of magmatic origin. The microthermometric data combined with stable isotope geochemistry and paragenetic relationships support a previously suggested the presence of a magmatic-hydrothermal solution. Considering this aspect and the geological features, the possibility is that the mineralizations were genetically related to Eğrigöz granitoid. These mineralizations are products of syn-extensional magmatism related with Menderes core complex and are one part of the same magmatic system and were formed in order from high temperature to low temperature as follow: Arpaçukuru Fe-Cu mineralization, İnkaya Cu-Pb-Zn-(Ag) mineralization and Değirmenciler Sb mineralization.

Keywords: Genetic relationship, Stable isotope, Fluid inclusion, Arpaçukuru, İnkaya, Değirmenciler, Simav, NW Turkey.

Numerical Solution of the Neutron Transport Equation Using SN Method with the First Kind of Chebyshev Polynomials

ÖZTÜRK H.

*Osmaniye Korkut Ata University, Faculty of Arts and Sciences, Department of Physics,
Osmaniye, Turkey,
hakanozturk@osmaniye.edu.tr*

The numerical solution of the neutron transport equation for one-speed neutrons in a finite homogeneous slab is investigated. The neutrons are assumed to be scattered isotropically through the medium involving constant isotropic source. The stationary transport equation is first written in the form of discrete ordinates and then it is solved for the eigenvalue spectrum of the neutrons using the Chebyshev polynomials of first kind. The eigenvalues are calculated for various values of the c_0 , the mean number of secondary neutrons per collision, using the Gauss-Chebyshev quadrature set and they are given in the tables.

Keywords: *Neutron transport equation, Eigenvalues, SN method, Chebyshev polynomials.*

The Experimental and Theoretical Spectroscopic Characterization of 3-[(N-methylanilino)methyl]-5-(thiophen-2-yl)-1,3,4-oxadiazole-2(3H)-thione

ÖZTÜRK N.¹, ALAŞALVAR C.¹, EL-EMAM A.A.²

¹Giresun University, Giresun, Turkey, nuri.ozturk@giresun.edu.tr, can.alasalvar@giresun.edu.tr

²King Saud University, Riyadh, Saudi Arabia, elemam5@hotmail.com

The structure of 3-[(N-methylanilino)methyl]-5-(thiophen-2-yl)-1,3,4-oxadiazole-2(3H)-thione, a potential bioactive agent, was characterized by FT-IR, Laser-Raman and UV-Vis. spectroscopic techniques and NMR chemical shifts. The quantum chemical computations of molecular structures, vibrational wavenumbers, ¹³C and ¹H chemical shifts and UV-Vis. spectroscopic parameters have been performed with DFT/B3LYP method at 6-311++G(d,p) basis set. The highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO) analyses have been theoretically investigated with the mentioned calculation level. The recorded experimental data have been compared with the calculated values. The computed geometric parameters, vibrational wavenumbers, NMR chemical shifts and UV-Vis. wavelengths have been found to be in a good agreement with the experimental spectral values and results of similar structures in the literature.

Keywords: 3-[(N-methylanilino)methyl]-5-(thiophen-2-yl)-1,3,4-oxadiazole-2(3H)-thione, FT-IR spectroscopy, Laser-Raman spectroscopy, DFT, NMR

Explanation of M1 Excitations Via Spin-Spin Interaction in Odd-Mass $^{229-233}\text{Th}$ Isotopes

TABAR E.¹, YAKUT H.¹, QULIYEV H.¹, KULIEV A.A.²

¹Physics Department of Sakarya University, Sakarya, Turkey, huseynqulu@yahoo.com

²Azerbaijan National Academy of Aviation, Baku, Azerbaijan, aakuliev@yahoo.com

The low-lying magnetic dipole (M1) transitions from the ground- to excited-states in heavy deformed odd-mass $^{229-233}\text{Th}$ isotopes have been microscopically investigated on the basis of the quasiparticle phonon nuclear model (QPNM). The problem of the spurious state mixing in M1 excitations is overcome by a restoration method allowing a self-consistent determination of the separable effective restoration forces. Due to the self-consistency of the method, these effective forces contain no arbitrary parameters. The results of calculations are compared with the available experimental data, the agreement being reasonably satisfactory.

Keywords: Thorium, Odd-mass, M1 excitations, Scissors mode, Rotational invariance, QPNM

Acknowledgement: This work was supported by the Scientific and Technological Research Council of Turkey (TUBITAK) (Project no.115F564).

Global Optical Potential for the Elastic Scattering of $^{17}\text{O} + ^{58}\text{Ni}$

SERT Y.

*Bozok University, Physics Department, Yozgat-Turkey
Sorgun Vocational School, Bozok University, Yozgat-Turkey*

In this study, we have analyzed the elastic scattering data of $^{17}\text{O} + ^{58}\text{Ni}$ reaction at 42.5-55 MeV (for six energy) by using the phenomenological optical model. In the calculations, we have fixed the real and imaginary diffusion parameters at 0.6 fm and observed that for the large imaginary radius (r_w) value. Having obtained the best fit for all data, we have investigated the change of the depth of the real and imaginary parts and we have derived Equations (1) and (2) for the variation of the depth of the real and imaginary parts of the nuclear potential.

$$V_0 = -66.0086 - 9.12539 \frac{Z_T}{A_T^{1/3}} + 3.84343 E_{LAB} \quad (1)$$

$$W_0 = 9.19286 + 1.27087 \frac{Z_T}{A_T^{1/3}} + 0.222857 E_{LAB} \quad (2)$$

Equations depend on the incident energy of the projectile ^{17}O with the charge number (Z) and mass number (A) of the target. The code FRESKO has been used for the theoretical calculations.

Keywords: *Optic model, Fresco, Elastic scattering.*

Sustainability Assessment of Renewable Energy Sources for Electricity Production in Turkey Using Analytic Network Process (ANP) with Benefits, Opportunities, Costs and Risks (BOCR) Analysis

ŞAHİN U.

*Muğla Sıtkı Koçman University, Ula Ali Koçman Vocational High School, Department of Electricity and Energy, Muğla, Turkey,
usahin@mu.edu.tr*

In this study, Analytic Network Process (ANP) was used for evaluation of sustainability of renewable energy sources for electricity production in Turkey. Totally 9 criteria which are green house gas emission, social acceptability, job creation, land requirement, water consumption, capacity factor, energy efficiency, accidents and levelized cost of energy were used for sustainability assessment. Totally 5 alternatives which are hydro, solar, wind, geothermal and biomass energy were selected. Additionally, Benefits, Opportunities, Costs and Risks (BOCR) analysis was used in Analytic Network Process (ANP) method. Alternatives were ranked by using Super Decisions 2.6.0 software. Results show that wind energy is the best fuel type for electricity production in Turkey.

Keywords: *Sustainability, Analytic network Process, Renewable energy sources, Energy policy, BOCR.*

Comparison of Sustainability Assessment of Fossil Fuels for Electricity Production in Turkey Using Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP)

ŞAHİN U.

*Muğla Sıtkı Koçman University, Ula Ali Koçman Vocational High School, Department of Electricity and Energy, Muğla, Turkey,
usahin@mu.edu.tr*

In this study, multi-criteria decision making methods were compared for evaluation of sustainability of fossil fuels for electricity production in Turkey. Totally 9 criteria which are green house gas emission, social acceptability, job creation, land requirement, water consumption, capacity factor, energy efficiency, accidents and levelized cost of energy were used for sustainability assessment. Additionally, totally 3 alternatives which are natural gas, coal and oil were selected. Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) were used as multi-criteria decision making methods. In AHP method, model is a hierarchical structure. In AHP method, the goal (selection of the best fuel type) is at the top level, criteria are at the middle level and alternatives (natural gas, coal and oil) are at the lower level of the hierarchical structure. In ANP method, criteria were modeled by a network structure and were grouped in Benefits, Opportunities, Costs and Risks subnetworks. Alternatives were ranked by using Super Decisions 2.6.0 software in both of methods. Results show that natural gas is the best fuel type for electricity production in Turkey according to the ANP and AHP methods.

Keywords: *Sustainability, Analytic network process, Analytic hierarchy process, Energy sources, Energy policy, BOCR.*

Some Magnetic Properties of Metallic Glasses as Perfect Raw Materials for Applications

ŞAHİNGÖZ R.¹, KANBUR ÇAVUŞ H.¹

Department of Physics, Bozok University, Yozgat, Turkey
recep.sahingoz@bozok.edu.tr, hatice.kanbur@bozok.edu.tr

In this study general production techniques of metallic glasses were explained. The advantages of metallic glasses in comparison to crystalline alloys with same composition were demonstrated. As indicated in the title, the question “why are metallic glasses perfect raw materials for applications?” was addressed in detail. Magnetic properties of metallic glasses were compared with metallic alloys and their advantages over the crystalline material were investigated. The change observed in the examined magnetic properties of the metallic glasses with different compositions, according to composition and heat treatment techniques was presented. The aforementioned advantages of metallic glasses were explained with figures and tables. Bulky glass structure will have its place in the industry and this work will include this topic within its scope.

Keywords: *Metallic glasses, Magnetic properties, Magnetic anisotropy, Coercivity, Tensile stres, Comprehensive stres and bulky metallic glasses.*

Enhanced Some Physical Properties of CuO Films by Changing Annealing Atmosphere

TAŞKÖPRÜ T., GENÇYILMAZ O.

*Department of Physics, Faculty of Science, Çankırı Karatekin University, Çankırı, Turkey
turanian@rocketmail.com; ogencyilmaz@karatekin.edu.tr*

In this study, copper oxide (CuO) films were deposited onto microscopic glass substrates using the successive ionic layer adsorption and reaction (SILAR) method. The deposited films annealed in air, oxygen, nitrogen and argon atmospheres. The influence of the annealing atmospheres on the structural, morphological, and optical features of the CuO films was investigated. XRD studies reveal that all the films are polycrystalline with monoclinic structure and exhibit (-111) and (111) preferential orientations. In XRD pattern of annealed films in argon atmosphere, the peak intensities considerably decreased. An additional diffraction peak located at $2\theta=31.750^\circ$ was observed in the XRD patterns of the samples annealed in nitrogen and argon atmospheres. This diffraction peak could not be assigned to the copper oxide formation. On the other hand, this diffraction peak well fit to melanothallite (Cu_2OCl_2) structure. The average crystallite size has been found to vary between 27 nm and 33 nm depending on the annealing atmospheres. FESEM images showed that deposited CuO films have good surface coverage. The thermal treatment under different ambient leads to the recrystallization of sample surface with new shape and grain size. The annealed films in air and oxygen have little transparency of about 10 and 15%, respectively in the visible region and had dark brown in color on visual observation. The annealed samples in nitrogen and argon have relatively high transmittance about 40 and 30% respectively and have greenish brown in color. The increase in transmittance and change in colour may be attributed to the formation of melanothallite which has been reported transparent in thin fragments and green. The findings in our study suggest that the physical properties of the CuO films strongly depend on the post annealing atmospheres.

Keywords: *CuO films, SILAR, XRD, Annealing atmosphere, Melanothallite.*

Mineralogy and Geochemistry of the Iron Mineralizations Associated with Uckapili Granitoid (Nigde)

TUMUKLU A., ALTUNCU S. and OZGUR F. Z

*Omer Halisdemir University, Geological Engineering Department, Nigde, Turkey,
alitimuklu@gmail.com*

Nigde Massif is the southest part of the CACC (Central Anatolian Crystalline Complex) which is composed of magmatic and metamorphic rocks. In the study area, formations of Nigde Group are Gumusler Formation which is composed mainly of gneiss and marble, Kaleboynu Formation which is composed of marble, gneiss and amphibolite, Asigedigigi Formation which is composed of marble, gneiss and amphibolite, Sineksizyayla Metagabbro and Uckapili Granitoid. Sineksizyayla Metagabbro intrude the Gumusler and partly Kaleboynu Formations. Uckapili Granitoid cuts all the other units. Nigde Massif is covered by Early Pliocene Incesu Ignimbrite and Quaternary alluvium.

The aim of this sutdy is to investigate the mineralogy and geochemistry of the iron mineralizations associated with Uckapili Granitoid.

Hydrothermal iron mineralizations located in the Nigde Massif are in the form of veins, veinlets and pocket filler in the marbles and schists. These iron mineralizations have settled as chimneys, rising to the surface in some places (Armutbeli).It is observed in the microscopic investigations that mineralizations show 3 separate features. These are:

- 1- Lepidocrocites having radial, needle-like and fibrous structures,
- 2- Aciniform goethites showing rhythmic alternation structures,
- 3- Pyrite, chalcopyrite (malachite) and ores containing small amounts of native Cu and Au cutting these FeO minerals as veins and droplets.

In the results of geochemical analysis carried out on 3 samples collected from the study area, $F_{e_2}O_3$ amounts were identified as 12.75%, 48.04% and 37.86%. In the same samples, Au and Ag anomalies were observed. In addition, CuO value of 1.09% was obtained in one sample. Although the iron mineralizations observed in the study area have no economic value according to the geochemical results, they are rich in elements such as Au, Ag and Cu.

Keywords: *Nigde massif, Uckapili granitoid, Iron, Hydrothermal.*

XPS Analysis of Cd Diffusion into Cu-poor and Cu-rich Cu(In,Ga)Se₂ Solar Cell Absorbers

ÜMSÜR B.^{1,2}, CALVET W.¹, BERCEGOL A.^{1,3}, STEIGERT A.¹, KISS J.⁴, MIRHOSSEINI H.⁴,
GORGOI M.¹, GREINER D.¹, KAUFMANN C.A.¹, LUX-STEINER M.CH.^{1,2} and
LAUERMANN I.¹

¹Helmholtz-Zentrum Berlin, Hahn-Meitner-Platz 1, D-14109 Berlin, Germany

²Freie Universität Berlin, Department of Physics, Arnimallee 14, D-14195 Berlin, Germany

³École Polytechnique, Route de Saclay, 91120 Palaiseau, France

⁴Max-Planck Institute for Chemical Physics of Solids, Nöthnitzer Straße 40, 01187
Dresden, Germany, buenyamin.uemsuer@helmholtz-berlin.de

Thin film solar cells based on polycrystalline Cu(In,Ga)Se₂ absorbers (CIGSe) have reached maximum conversion efficiencies of 22.6% on the laboratory scale, already exceeding efficiencies of solar cells based on polycrystalline silicon. However, many questions about the exact surface and near-surface composition remain and a complete picture of the formation of the interface to the CdS buffer layer is still under debate.

In this work, we compare Cu-poor and Cu-rich grown co-evaporated CIGSe absorbers with a bulk concentration ratio $[Cu]/([In]+[Ga])$ of 0.80 and 0.95. The Cu-poor sample is close to the optimum composition for high-efficiency devices in our lab while the Cu-rich sample, although close to stoichiometric conditions, behaves fundamentally different. Ultrathin CdS layers were deposited by chemical bath deposition (CBD) on both absorbers under the same conditions with an estimated thickness of less than 10 nm which allows the simultaneous investigation of the CIGSe absorber, the CdS buffer layer, and the corresponding interface region using hard x-ray photoelectron spectroscopy (HAXPES) with an excitation energy of 3000 eV. The aim was to analyze the interface formation especially focusing on Cu and Cd species, which play an important role in this process. In addition, possible diffusion phenomena were investigated in-situ under ultrahigh vacuum (UHV) conditions after annealing at temperatures ranging from 180 to 400 °C in steps of 20 °C.

It was shown that the diffusion mechanism of Cd differs fundamentally with respect to the Cu concentration of the CIGSe absorber material. Namely, the Cd diffusion in Cu-poor sample is a two-step process, where Cu atoms are actively exchanged by Cd impurities during the diffusion process; whereas in the Cu-rich sample, the Cu atoms are not directly involved in the diffusion process but they indirectly play a role as V_{Cu} defects, where Cd impurities are being incorporated. In addition, it was found that the two diffusion mechanisms in both samples are also quantitatively well distinguishable from the perspective of the activation energies. By having the lower activation energy for Cd diffusion in Cu-poor samples, no trace of Cd was detected at the near surface region after the final annealing temperature 400 °C, whereas a small amount of Cd could be still measured within the same depth of Cu-rich sample after the same annealing process. Another distinct difference in the interface formation of Cu-poor and Cu-rich CIGSe/CdS samples upon the annealing process is the Ga out-diffusion towards the CIGSe surface. In contrast to Cu-rich samples, a significant Ga out-diffusion was observed in case of Cu-poor samples at elevated temperatures between 320 and 400 °C, where they probably occupy V_{Cu} sites.

Keywords: *Chalcopyrite solar cells, Hard X-ray photoelectron spectroscopy, Interface*

Trace Elements of Sulfide Minerals in Dursunbey (Balıkesir-Turkey) Pb-Zn Ore Deposit

ÜNAL ÇAKIR. E.

*Bozok University, Department of Geological Engineering, Yozgat, Turkey
esra.unal@bozok.edu.tr*

Dursunbey Lead-Zinc deposit is located around the Balıkesir province Dursunbey district Güğü village. The study area are evaluated in the north western Anatolia (Biga Peninsula) mineralization. Biga Peninsula is one of the important Turkey's Pb-Zn province that it contains a large number of lead-zinc mineralization and deposit. The study area is located within the Kütahya J21-a1 and a3 map section with 1:25000 scale and Paleozoic to Quaternary age units has been observed in the region. The oldest units which is metamorphic rocks of Menderes Massive and the Izmir-Ankara zone's ophiolitic melange are intruded by Miocene Alaçam granite. Neogene units starts with the Early Miocene aged Yeniköy Formation and ends with alluvial.

Trace elements of the sulfide minerals were determined by inductively-coupled plasma mass spectrometry (n=20, ACME laboratory-Canada). The results indicate that major elements (S, Zn, Pb, Fe,), trace elements Cd, W, Bi, Sr, Ag, V, Co, As, Mo, Be, Se, Zr, Rb, Ge, Ce, B, Y, Au, Ni and La are most abundant in all samples. Statistical analysis of element correlations indicates high values between Cd-Sb, Ag-Sb, Se-Bi, Sb-Ag, and Cu-Se in samples. Also these trace elements exhibit low correlations with the major elements in sphalerite (Zn and S) and galena (Pb and S), they are present as micro-inclusions in the sulfides. The high negative correlation between Zn and Fe in sphalerite indicates their mutual substitution in the sphalerite crystal lattice. The high positive correlation between Zn and Cd in galena suggests that both elements are present as sphalerite micro-inclusions in galena.

All the samples have low total Rare Earth Element (REE) concentrations (from 4,117 ppm to 68,450 ppm) and a wide range of light rare earth element/high rare earth element ratios (4,0181–12,76765). These results indicate that the ore-forming fluids occur under a reducing environment. Comparison REE compositions and parameters of sphalerites, galenas, pyrites, ores showed that the ore-forming fluids might come from polycomponent systems. Combined with the tectonic setting and previous isotopic geochemistry evidence, we conclude that the ore-deposit genesis is hydrothermal, sedimentary reformed, with multisources characteristics of ore-forming fluids.

Keywords: *Trace elements, Rare earth element (REE), Genesis, Dursunbey (Balıkesir) Pb-Zn Ore Deposit*

Acknowledgement: *This study has been supported by Bozok University Scientific Research Projects Department for 2015MMF/A179 coded project.*

Application of Sulfur and Carbon Isotopes for Geochemical Investigation of Oil Shale: A Case Study from the Çeltek Formation, Sorgun, Yozgat (Turkey)

YAVUZ PEHLIVANLI B.

Bozok University, Department of Geological Engineering, 66900, Ataturk Road, Yozgat, Turkey
berna.yavuz@bozok.edu.tr

Investigated area is located in Sorgun district of Yozgat, Turkey and covers an area of about 1000 km². Paleozoic Campanian-Maastrichtian, Eocene, Miocene and Quaternary aged units are exposed in the study area. Lower Eocene Çeltek Formation in these units, which are defined as oil shale, is particularly noticeable in terms of the coal content. The total organic carbon (TOC) contents of Çeltek Formation oil shales varies between 1,97 and 19,17% (average 6,30%) indicating fair to very good source rock potential.

Hydrogen index values of these shales are in the range of 94–586 mg HC/g TOC. The organic matter in the oil shales is dominated by Type II kerogen and mixed II–III kerogens with a minor contribution of Type III kerogen, as supported by kerogen microscopy.

The Çeltek Formation oil shales are likely to be an oil-source rock. Maturity indicators such as vitrinite reflectance and pyrolysis data (i.e., Tmax and PI) indicate that most of the oil shale samples are generally thermally mature at the early-mature to peak oil window stage.

In this study $\delta^{13}\text{C}$ and $\delta^{34}\text{S}$ values were determined for the potential source rocks and depositional environment. The $\delta^{13}\text{C}$ values are between -30,98‰ to -24,17‰ VPDB (average -27,42‰), and $\delta^{34}\text{S}$ values are between -23,98 ‰ to 18,07‰ VCDT (average 6,78 ‰).

The sulfur isotope ratio for organic matter would seem, therefore, to give information concerning the isotopic content of the source sulfur at the time of oil shale formation. Several studies suggested that the $\delta^{34}\text{S}$ values could be effective on pH and $f\text{O}_2$ of the environment. In some studies, a slight decrease in pH values $\delta^{34}\text{S}$ values due to positive values, while negative values $f\text{O}_2$ (oxygen fugacity) suggested that without increasing. Therefore wide range of $\delta^{34}\text{S}$ values of studied oil shales in the study area could be affected by $f\text{O}_2$ and pH.

The $\delta^{13}\text{C}$ isotopes are fractionated with respect to changes in temperature. Carbon isotope content of cold water planktons is enriched, but as the temperature decreases, dissolved CO_2 content is reduced thus lowering the $\delta^{13}\text{C}$ value. Considering the source and living conditions of C3 plants, $\delta^{13}\text{C}$ of the Çeltek Formation oil shales in the Sorgun basin are thought to be formed under warm-water conditions. Thus, $\delta^{13}\text{C}$ and $\delta^{34}\text{S}$ values can be used as an effective tool to demonstrate oil–source rock correlation.

Keywords: Çeltek formation, Sulfur isotopes, Carbon isotopes, Oxygen fugacity, Oil–Source rock Correlation

Acknowledgement: This study has been supported by Bozok University Scientific Research Projects Department for 2015MMF/A180 coded project.

Synthesis, Structural and Electronic Characterization of 2-Carboxy-4-Hydroxyanilinium Chloride Hydrate

YILDIRIM M.H.¹, ODABAŞOĞLU M.²

¹Giresun University, Giresun, Turkey, hakki.yildirim@giresun.edu.tr

²Pamukkale University, Denizli, Turkey, modabasoglu@pau.edu.tr

We report synthesis, spectroscopic and quantum chemical studies of 2-Carboxy-4-hydroxyanilinium chloride hydrate (I) compound. From the single crystal X-Ray crystallography, we have found that compound I crystallizes in the orthorhombic Pbam space group. Asymmetric unit have two independent molecules. All atoms of in the molecule are on the mirror symmetry plane except for only one water atom. In order to get detailed spectra interpretations, infrared and UV-Vis. spectra calculations have been performed after geometry optimization. Experimental and calculated structural parameters have been compared by calculating RMS errors. Frontier molecular orbital analysis, HOMA and NICS aromaticity indices calculations, molecular electrostatic potential map analysis and non-linear optical property analysis of the compound have been performed by computational methods.

Keywords: 2-Carboxy-4-hydroxyanilinium, 2-amino-5-hydroxybenzoic, Spectroscopy, DFT.

POSTER PRESENTATIONS

Deciphering the Conditions Resulted in the Deposition of Hançili Formation's Organic-Rich Shale: Anoxia or High Sedimentation Rate?

AKKAYA P.¹, MORADI A.V.¹, SARI A.²

¹Ankara University, Graduate School of Natural and Applied Sciences, Keçiören 06110,
Ankara, Turkey

²Ankara University, Department of Geological Engineering, Tandoğan 06100, Ankara, Turkey
pakkaya@ankara.edu.tr

The geochemical signature of Miocene-aged bituminous shales of Çankırı-Çorum Basin has been investigated in this study. In an ascending order the studied sequence in the studied area is composed of 6 formations, including Late Cretaceous aged tectonic melange, Early Paleocene aged turbiditic and submarine deposits, Late Eocene Deliceirmak lime stones, Early Oligocene İncik Formation, Late Oligocene aged Kızılırmak and Güvendik formations, Miocene aged Hançili and Bayındır formation, Pliocene aged Bozkır and Değim formations and Quaternary units. The studied Hançili Formation is Miocene aged and composed of clay stone, bituminous shale, bituminous marl and coals. The studied bituminous shale and coal samples contain 6 and 38 wt% TOC on average, respectively.

Various elements such as Mo, Mn, Ni, V, U, Th, Cr, Co, Sc are used for the assessment of paleoredox conditions. Ratios such as V/(V+Ni), V/Cr, Ni/Co, V/Sc, U/Th, Th/U, Mo/Mn were used to imply the redox conditions under which the studied sedimentary rocks were deposited. Besides these ratios, the Fe-S-TOC relationships of the samples were studied and used to reconstruct the paleoredox conditions of the basin during the deposition of Hançili Formation.

The results revealed that the Hançili Formation were deposited under an oxic-dysoxic regime while high sedimentation rate enhanced the preservation of organic matter under unfavorable redox conditions.

Keywords: Bituminous shale, Bituminous marl, Hançili formation

Interlayer Thickness Dependent Electrical Characteristics of Al/(3% Zn-Doped Al/Pva)/p-Si (Mps) Structures at Room Temperature

BADALI Y.¹, NIKRAVAN A.², BILGEN BENLİ B.¹, ALTINDAL Ş.³, USLU İ.¹

¹Department of Advanced Technologies, Institute of Science and Technology, Gazi University, Ankara, Turkey

²Department of Environmental Engineering, Institute of Science, Hacettepe University 06800, Ankara, Turkey, afsun.nikravan@gmail.com

³Department of Physics, Faculty of Science, Gazi University, Ankara, Turkey

Al/p-Si structure with five different (3% Zn-doped PVA) interlayer thicknesses (5, 10, 20, 30 and 50 nm) was fabricated. Their main electrical parameters such as ideality factor (n), barrier height (Φ_{Bo}), rectifying rate (RR), series and shunt resistances (R_s and R_{sh}) were found from the current-voltage (I-V) characteristics as function of thickness interfacial layer at room temperature. Experimental results show that these parameters are strong function of interlayer thickness. There is a good linear relation between Φ_{Bo} and n as $\Phi_{Bo} = (-0.129n + 0.96)$ eV. For the ideal case ($n=1$), the value mean barrier height (Φ_{Bo}) was found as 0.831 eV. Among them, Al/p-Si structure with 5 nm interlayer thickness has the best RR (4.4×10^7) and the bad one is the 50 nm interfacial layer thickness. It is show that the quality of structure decreases with increasing interlayer thickness. Their capacitance/conductance-voltage (C/G-V) characteristics were also investigated at 1 MHz. The C-V plots have a distinctive anomalous peak in the forward bias region due to the existence of carrier charges at interface traps and R_s and then they go to negative values. Such behavior of C-V behavior at the accumulation or forward bias region is known negative capacitance (NC) behavior in the literature.

Keywords: MPS structures with five different (3% ZnO-doped PVA) interlayer, Rectifying rate, Linear relation between Φ_{Bo} and n , Interface traps and series resistance, Anomalous peak

Integration of Kızılay Mineral Spring and Afyon Gazlıgöl Geothermal System

BÜLBÜL A.¹, KOÇ A.C.²

¹*Pamukkale University Department of Geological Engineering.*

²*Pamukkale University Department of Civil Engineering.*

Kızılay Mineral Water Spa occurs in Afyon Gazlıgöl region. These spas have been using in order to get heal for some desease since Ottoman Age and in 1927 a mineral water spa bottling fabrique was founded allotted to Kızılay for donation by Atatürk. Occurrence of Kızılay mineral spa is closely related with Gazlıgöl geothermal system. İn the study area.

Presence of Kızılay mineral Spa is clesely related with Gazlıgöl Geothermal field. In the study area lithological units respectively overlays upward as Paleozoic Kuarzit-Schist, Late Middle Miocene sedimants and volcanics, Pliocene Karakaya Bazalts, Quaternar alluvial fan, Quaternar alluvium, travartenos. Normal slope faults with Northwest-Southeast direction occurs. The most important of them is Gazlıgöl fault accompanies vertical oblique faults.

Both of Gazlıgöl Geothermal water and Kızılay Mineral Spa are Na-HCO₃ type and very similar. Ascending geothermal fluids along Gazlıgöl Fault that is drilled by G1 (800 m deep, 69°C) thermal well, mix aluvial aquifer water and loss heat by conductive cooling evolves Afyon-Kızılay Mineral Spa. The mixing mineral water in alluvial aquifer is Pumped by 4 wells (60 m) and bottled in alluvial aquifer at Kızılay Mineral Water Spa. Mixing ratio is determined with different approximation by PhreeqC, also silica and chloride mixing models. Geothermal water mixing ratio in Kızılay Mineral Spa varies between % 90 and % 79. A conceptual model showing occurrence of Kızılay Mineral Water.

Keywords: *Geothermal systems, Kızılay mineral spring, Gazlıgöl-Afyon, Hydrogeochemistry*

Effect of Alloying Elements on Mechanical Properties of Fe-based SuperAlloys

BÜYÜKAKKAŞ S.

Ömer HALisdemir University, Niğde, Turkey ,
sakkas@nigde.edu.tr

The mechanical properties of the material play an important role in technological applications. Therefore alloying elements and their ratio are influenced in determining the properties of the materials. In this study, Fe- 40%Ni- 2%Mn, Fe- 40%Ni- 2%Si and Fe-40%Mn-2%Si alloys has been subjected to heat treatment at 1150 °C, 1200 °C for 24 hours and at 1200 °C for 16 hours respectively. Iron (Fe) is main element of steel. When Nickel (Ni) is combined with other elements, it has been increased the hardness of the steel. Nickel (Ni) and mangan (Mn) elements are austenite former and austenite stabilizers elements. Silicon is also an element with ferrite-forming and stabilizing feature. Fe-40%Ni-2%Mn, Fe-40%Ni-2%Si and Fe-40%Mn-2%Si alloys have austenite structure. The mechanical properties of the three alloys was investigated by Vickers hardness measuring method. As alloying elements and their proportions were changes, it was observed that the change of mechanical properties. This is consistent with the literature.

Keywords: *Vickers hardness, Superalloys, Alloying elements*

Investigation of Hydrothermal Alteration by ASTER SWIR Satellite Images (Ağmaşat Plato, Zara-SİVAS)

CANBAZ O.¹, GÜRSOY Ö.² and GÖKCE A.¹

¹*Cumhuriyet University, Department of Geological Engineering, Sivas, Turkey,
ocanbaz@cumhuriyet.edu.tr*

²*Cumhuriyet University, Department of Geomatics Engineering, Sivas, Turkey,
ogursoy@cumhuriyet.edu.tr*

Hydrothermal alteration study is one of the most important exploration tools in prospecting of hydrothermal ore deposits. Middle-Late Eocene Köseadağ Syenite and contemporaneous Karataş Volcanics and also Late Miocene – Pliocene Şerefiye Basalt show strongly hydrothermal alteration in Ağmaşat Plato (Zara-SİVAS). Hydrothermal alteration in this area is characterized by silicification, sericitization-argilization and chloritization. This study is aimed to identify the characteristics and distribution of alteration by ASTER satellite SWIR images. The results of the spektroradiometer measurements and X-Ray diffractometric investigations of samples collected from the alteration area were processed. Decorelation stretching and principal component analyses, band rationing were applied to the ASTER satellite images to be able to increase the visual interpretation and seperating the lithology of the geological units. To collecting endmember on the ASTER images, and classify the images, the “Spectral Angle Mapper” (SAM) and Matched Filtering methods were used. The results are presented on a 1:10.000 scale map. Silicified, sericitized, argilitised and chloritized zones were identified in different colors and tones. Distributions of these alteration zones show that the area is an important potential target for hydrothermal mineral resources.

Keywords: *Hydrothermal alteration, Satellite images, Köseadağ, Sivas*

A Study on Elastic Scattering of $^{19}\text{F} + ^{159}\text{Tb}$ Reaction

ÇİÇEK Ş.¹, AYGUN M.¹, AYGUN Z.²

¹Department of Physics, Bitlis Eren University, Bitlis, Turkey

²Vocational School of Technical Sciences, Bitlis Eren University, Bitlis, Turkey

Elastic scattering angular distribution of ^{19}F by ^{159}Tb at 98 MeV is examined. To obtain real potential, the double folding model is used within the optical model. Imaginary part of nuclear potential is taken as Woods-Saxon type. All the results are compared with the literature as well as the experimental data.

Keywords: *Optical model, Double folding Model, Elastic scattering.*

An Theoretical Analysis of Quasi-elastic Scattering of ${}^7\text{Li} + {}^{120}\text{Sn}$ System

ÇİÇEK Ş.¹, AYGUN M.¹, AYGUN Z.²

1Department of Physics, Bitlis Eren University, Bitlis, Turkey

2Vocational School of Technical Sciences, Bitlis Eren University, Bitlis, Turkey

Quasi-elastic scattering data of ${}^7\text{Li}$ on ${}^{120}\text{Sn}$ are investigated at 19.5, 20.5 and 25.0 MeV. Phenomenological model and double folding model based on the optical model are used in calculations. Also, the effect of the surface potential on the interaction is examined. All the results are compared with the experimental data.

Keywords: *Optical model, Double folding model, Elastic scattering, Quasi-elastic scattering.*

Microscopic Optical Model Analysis of ${}^7\text{Be} + {}^{58}\text{Ni}$ Elastic Scattering System at $E_{\text{Lab}} = 23.2$ MeV

DİREKÇİ M.¹, BOZTOSUN İ.^{2,3}

¹Bozok University, Physics Department, Yozgat-Turkey, mikaildirekci@yahoo.com

²Akdeniz University, Physics Department, Antalya-Turkey

³Akdeniz University, Nuclear Sciences and Application Center, Antalya-Turkey

In this study, angular distribution for the elastic scattering of ${}^7\text{Be}$ which is weakly-bound ($S_{\alpha} = 1.586$ MeV) and known as a well pronounced ${}^3\text{He} + {}^4\text{He}$ cluster structure on ${}^{58}\text{Ni}$ target at laboratory energy of 23.2 MeV. Therefore this nucleus has a large probability to breakup into its constituent cluster features, while approaching the Coulomb or nuclear field of a target nucleus, or to transfer just one of the two clusters to the target. This scattering system has been analyzed within the Optical Model (OM) framework. Firstly, the analysis of angular distribution of this scattering system have been re-performed by phenomenological optical potentials using Woods-Saxon (WS) form for both real and imaginary part of potential. Secondly, the system has been analyzed by Double-Folding (DF) potential that calculated by using phenomenological matter density forms of ${}^7\text{Be}$ nucleus are Gaussian and 3-parameter Fermi, respectively. Comparative analysis of phenomological and microscopic optic model has been aimed and also sure, first time we suggested phenomenological two different kinds of matter density of ${}^7\text{Be}$ nucleus to analyze that system. We observed that for the large imaginary radius, (r_w), provides very good agreement between theoretical and experimental results have been obtained with small χ^2/N values.

Keywords: *Weakly bound nucleus, Optical model, Double-folding potential, Matter density*

Coal Petrography Analysis of Ç and SJ No of Samples That Belongs to New Çeltek Coal Companies

EKİNCİ Z.D.¹, YAVUZ PEHLİVANLI B.²

¹General Directorate of Mineral Research and Exploration, 06800, Çankaya/Ankara
denizekinci@mta.gov.tr

²Bozok University, Faculty of Engineering and Architecture Geological Engineering
Department, 66100, Yozgat, bernayavuz80@gmail.com

Investigated area is located in Sorgun district of Yozgat, (Turkey) and Lignite coal production is performed by New Celtek Coal Company. Paleozoic, Campanian-Maastrichtian, Eocene, Miocene and Quaternary aged units are located at the study area. Lower Eocene Formation Celtek in these unit is particularly noticeable in terms of the coal content and in the same units have also rocks defined as oil shale.

Organic petrography studies of 47 examples that belongs to 2 drills which is made inside the company are examined by Leica DM 4000M TIDAS CCD UV/NIR top illuminated microscope. 400x oil objective is used for examples micro-Petrographic identification. The presence of organic carbon in the study and maseral species were determined and vitrinite reflectance measurements were made. These values ranged from 0.298 to 0.617 and corresponds to carbonization degree of sub-bituminous and lignite. (Ward, 1984; Stach 1982). Paleo temperature values shows that the genesis temperature of the samples is between (Boggs, 1987) <100 and 130 °C. The depth of the examples that belongs to two drills for Ç between 56 m and 17 m (n = 30); for SJ between 81 to 89 m (n = 17). These examples are weak laminated, bituminous shale content, which is partly silicified and carbonated. Between vitrinite reflectance values with depth and temperature of the samples shows a direct correlation between the sudden increase of carbonization. Vitrinite reflectance values of examples that obtained from the company New Celtek Coal Company (R_{max} 0.3 to 0.6) and temperature data of the drill called New Çeltek Source which is opened with thermal goals in the area (temperature 45 ° C; flow rate of 50 l/s) is compatible. According to maserals evaluation that made 40 of the examples, huminite, inertinite, liptinite and inorganic component (Pyrite and Clay Mineral) rates of the examples were determined. While 10 examples have all the components, 30 examples have only huminite and inorganic component is determined. According to petrographic studies we can say that sovrans maserals belong to group huminite (ülminite, gelinite, korpohüminite, densinite, attrinite) The maserals that belongs to iternite (makrinite) and liptinite (kütünite, sporinite) are in small amounts. Average huminit/vitrinit reflection values of examined coals are changing between % 0.26-0.45. According to this the coals that belongs to New Çeltek Coals Companies, have carbonization degree in DIN standards "Mat Brown Coal" while in ASTM standards is "lignite"

Keywords: Organic petrography, Eocene, Celtek formation, Huminite, Inertinite, Liptinite, New Celtek Coal Operations, Yozgat (Turkey).

Geometry Optimization, Spectroscopic Characterization and Nonlinear Optical Properties of Dimethylammonium 4-Nitrobenzoate: A DFT Study

ESMER K.¹, AVCI D.², TAMER Ö.², ATALAY Y.²

¹Marmara University, Istanbul, Turkey, kadir.esmer@marmara.edu.tr

²Sakarya University, Sakarya, Turkey, davci@sakarya.edu.,

Organic materials have received a great deal of attention due to their high nonlinearities and rapid response in the electro optic effect compared to inorganic materials. In the search for new organic materials, aromatic compounds with donor and acceptor substituents are extensively studied. In this study, the optimized geometry, vibration frequencies, electronic absorption spectrum, HOMO-LUMO energies, molecular electrostatic potential surface and nonlinear optical properties of dimethylammonium 4-nitrobenzoate (DMNB) – an organic charge transfer complex were calculated by using Density Functional Theory (DFT). Obtained theoretical result demonstrated that there is a good agreement between DFT results and previously reported experimental data. Small energy gap between HOMO and LUMO indicated that charge transfer interactions occur in DMNB. Hydrogen bonding interactions were clearly visualized with molecular electrostatic potential surface.

Keywords: *Dimethylammonium 4-Nitrobenzoate, Nonlinear Optic, DFT, IR*

Electrical Analysis of Polymer Thin Films: Comparison Study

ŞAHİNGÖZ R.¹, KANBUR ÇAVUŞ H.²

*Department of Physics, Bozok University, Yozgat, Turkey
recep.sahingöz@bozok.edu.tr, hatice.kanbur@bozok.edu.tr*

In this work, high refractive index polymers poly(pentachlorophenyl methacrylate-co-glycidyl methacrylate) and poly(pentabromobenzyl methacrylate-co-glycidyl methacrylate) were comparatively studied. Firstly, high refractive index polymer thin films (HRIPTFs) were prepared using spin coating technique under the same conditions. Forward and reverse bias I-V characteristics of ITO/PEDOT:PSS/HRIPTF/Al heterojunction structures were investigated. Experimental results showed that the electronic properties of poly(pentachlorophenyl methacrylate-co-glycidyl methacrylate) are better than electronic properties of poly(pentabromobenzyl methacrylate-co-glycidyl methacrylate).

Keywords: *High refractive index polymers, Polymer thin film, Coating technique.*

Effects of Mean Free Path Parameters for Reaction Cross-Section Calculations

KAPLAN A¹., ÇAPALI V¹., ŞEKERCİ M.¹, ÖZDOĞAN H².

¹Süleyman Demirel University, Isparta, Turkey, abdullahkaplan@sdu.edu.tr,
velicapali@sdu.edu.tr, mertsekerci@sdu.edu.tr

²Akdeniz University, Antalya, Turkey, hasanozdogan@akdeniz.edu.tr

The probability of nuclear reaction occurrence is basically named as reaction cross-section. The investigation of the reaction cross-section may have critical importance for material development, avoiding unexpected nuclear reaction results also radioisotope production. In some cases with the experimental difficulties or lack of data, theoretical calculations may come forward to cover the absence. For similar situations, scientists have developed different nuclear reaction codes to compute reaction cross-section, spectrum of out-going particles and dose calculations including many theoretical nuclear models. These models include lots of parameters that effect the results. In this study, effects of the mean free path parameters for $^{209}\text{Bi}(n,xn)$ reaction at 14.2 MeV, $^{58}\text{Ni}(n,xp)$ reaction at 9 MeV and 14.8 MeV induced neutron energies have been investigated by using kmfp parameter in PCROSS calculations. In ALICE/ASH calculations, COST parameters have been investigated for $^{60}\text{Ni}(p,n)^{60}\text{Cu}$, $^{209}\text{Bi}(d,n)^{210}\text{Po}$ and $^{241}\text{Pu}(p,2n)^{240}\text{Am}$ reactions. Obtained results have been compared with the experimental data taken from the EXFOR database.

Keywords: Mean free Path, COST, ALICE/ASH, PCROSS, EXFOR.

Investigations of Self Excited Oscillations Along Perforated Plates Which Have Different Hole Diameters

OZALP C. ve KARA O.

*Osmaniye Korkut Ata University Energy Systems Engineering, 80000, Osmaniye, Turkey,
coskunozlap@osmaniye.edu.tr, osmankara@osmaniye.edu.tr*

The shear flow of a fully turbulent boundary layer along a perforated plate, which is bounded by a closed cavity on its backside, can give rise to highly coherent, self-sustained oscillations. These oscillations are characterized in terms of velocity fluctuations and quantitative images of the instantaneous and averaged flow structure using a technique of high-image-density particle image velocimetry (PIV).

Variations of the effective length L of the perforated plate show nearly invariant values of dimensionless frequency fL/U ; in which f is the predominant frequency of oscillation and U is the freestream velocity. In fact, this relationship holds even when the diameter of the hole pattern is altered. Variation of the hole diameter D does, however, strongly influence the amplitude and degree of organization of the self-sustained oscillation. Four different plates were employed, with hole diameters of $D = 6.4$ mm, 12.7 mm, 19.1 mm and 25.4 mm. The plate was maintained constant thickness at $t = 11$ mm for all experiments. The freestream velocity was maintained at a value $U = 240$ mm/s and the momentum thickness of the turbulent boundary layer was $\Theta = 7.5$ mm. [The Reynolds number based on Θ was $Re\Theta = 1800$.] It is demonstrated that, as the hole diameter becomes larger relative to the inflow boundary layer thickness, the amplitude of the predominant spectral peak is substantially attenuated and, in a limiting case, undetectable.

Keywords: *Self-sustained oscillations, Perforated plate, PIV, Velocity spectra*

Factors Controlling Element Composition Variations and Organic Matter Accumulation of Tekirler Organic-Rich Rocks (Ankara/Turkey)

KOCA D.¹, SARI A.²

¹Batman Üniversitesi, Müh-Mim. Fakültesi, Petrol ve Doğalgaz Mühendisliği Bölümü, Batman, Turkey
derya.koca@batman.edu.tr

²Ankara Üniversitesi, Mühendislik Fakültesi, Jeoloji Mühendisliği Bölümü, Ankara, Türkiye,
sari@eng.ankara.edu.tr

Organic-rich rocks of Tekirler from Paleocene-Eocene are determined as an excellent source rock. 125 samples taken from the study area (Tekirler:70; Goksarlik:25; Kepeztepe:30) suggest an average of 2,19 %wt., 4,18 %wt. and 3,20 %wt. of organic carbon values, with a range between 0,07 and 13,90 %wt. respectively. Several geochemical (organic and inorganic) and mineralogical analysis were used for determining the factors controlling composition variations and source rock of Tekirler organic-rich rocks. Analyzed samples indicated enrichments principally in these elements Ni, U, Mg, Ca, Mn, Co, Sr, V, Cu, Pb, Se and As. These enrichments are related to several factors as redox conditions of depositional environment, C_{org} values, and source rock. Also Chemical Alteration Index and Chemical index of weathering values indicate that Tekirler samples were generated from a moderately weathered source rocks. Results of redox conditions of depositional environment obtained with several geochemical parameters such as Ni/Co, V/Cr, U/Th, and the relationship between C_{org} with certain elements show element compositional variations of samples. However P/Al and Ba /Al productivity proxies demonstrate that the accumulation of organic matter was not controlled only by primary productivity. According to these values organic-rich rock samples are generally deposited in oxic – suboxic conditions.

Keywords: Organic matter, Oil shale, Organic geochemistry, Nallıhan

The Natural Radiation Level and Its Possible Effect on Human Health: Gümüşhane Example

MADEN N.¹, ÇELİK N.², AKARYALI E.³

¹Gümüşhane University Geological Engineering Department, Gümüşhane, Turkey,
nmeden@gumushane.edu.tr

²Gümüşhane University, Physics Engineering Department, Gümüşhane, Turkey,
(necati.celik@gumushane.edu.tr)

³Gümüşhane University Geophysical Engineering Department, Gümüşhane, Turkey,
eakaryali@gmail.com

The uranium, thorium, potassium elements found naturally in the earth's crust show radioactivity. Therefore, the minerals containing these elements such as orthoclase (KAlSi_3O_8), biotite ($\text{K}(\text{Mg,Fe})_3(\text{AlSi}_3\text{O}_{10})(\text{F,OH})_2$), muscovite ($\text{KAl}_2(\text{AlSi}_3\text{O}_{10})(\text{F,OH})_2$), uraninit (UO_2), Monazite ($\text{Ce, La, Nd, Th})\text{PO}_4$) are radioactive. These minerals are widespread within the chemical compositions of the granite, granitoid or granodiorite as seen in Gümüşhane. The Gümüşhane pluton, a high-K calc-alkaline I-type granodiorite/granite complex, shows a compositional zonation ranging from biotite–hornblende granodiorite in the NW through biotite–hornblende granite to leucogranite/granophyre in the SE. The abundance of radioactive elements in Gümüşhane has necessitated the making this study.

Within the scope of this project, the measurements were gathered at 129 points relevant to regional geology with gamma ray spectrometer equipment in the Gümüşhane province covering the coordinates of (38.7°E, 39.8°N) ile (40.2°E, 40.85°N). It is determined that the total dose rate, the effective dose rate and the equivalent annual dose rate values change from 1045.9 nGy/h to 1221.3 nGy/h, 732.4 nSv/h to 855.2 nSv/h and 0.89 mSv/year to 1.04 mSv/year, respectively, by evaluating the observation values. When the computed equivalent annual dose rate values were considered, it was seen that the results were under the world average level given by the UNSCEAR and that they did not have any disease-making effect on human health.

Keywords: Gümüşhane, Natural radiation, Gamma ray spectrometer

Acknowledgement: This research has been supported by Gumushane University Scientific Research Projects Coordination Department. Project Number:2012.02.1717.3

Cross-Section Calculations of (γ ,xn) and (p,xn) Reactions for ^{197}Au

ÖZDOĞAN H¹., ŞEKERCİ M²., ÇAPALI V²., KAPLAN A.²

¹Akdeniz University, Antalya, Turkey, hasanozdogan@akdeniz.edu.tr

²Süleyman Demirel University, Isparta, Turkey, mertsekerici@sdu.edu.tr,
velicapali@sdu.edu.tr, abdullahkaplan@sdu.edu.tr

In this study, cross-sections of (γ ,n), (γ ,2n), (γ ,3n) and (p,xn) reactions for ^{197}Au have been calculated. The main aim of this study is to investigate the pre-equilibrium and equilibrium effects on ^{197}Au . While the Weisskopf-Ewing and equilibrium models have been used for the equilibrium process in the calculations, the hybrid, geometry dependent hybrid and two component exciton nuclear reaction models have been used for the pre-equilibrium process. For this purpose, the TALYS 1.6, EMPIRE 3.2 and ALICE/ASH codes have been used. The calculated results have been discussed and compared with the experimental data.

Keywords: ^{197}Au , Cross section, TALYS 1.6, EMPIRE 3.2.

Stable Isotope Investigation of Gürkuyu Sb Mineralization (Gediz-Kütahya-NW Turkey)

ÖZEN Y., ARIK F.

Selçuk University, Konya, Turkey, ybozkir@selcuk.edu.tr

The Gürkuyu Sb mineralization is located in the western part of Anatolian tectonic belt, in southern part of İzmir-Ankara zone and in northern part of Menderes Massif. The mineralization located at west of the Koca hill in east of Gürkuyu village of Gediz (Kütahya-Turkey) has been characterized through the detailed examinations involving sulfur and oxygen isotope.

The Gürkuyu Sb mineralization is in the Precambrian Kalkan formation composed of biotite-gneiss and the Upper Cretaceous Dağardı melange composed of peodotite and serpentinite. In Gürkuyu mineralization, primary ore minerals are antimonite and pyrite, secondary ore minerals are senarmontite, valentinite, orpiment and realgar. Quartz and calcite are the most common gangue minerals.

In Gürkuyu Sb mineralization, $\delta^{34}\text{S}$ values of stibnite are ranged from 1.0 ‰ to 1.3 ‰. $\delta^{18}\text{O}$ values of quartz are ranged is 15.8 ‰ in Gürkuyu mineralization. Sulfur and oxygen isotope values are similar to the values for magmatic rocks and to the values for fluids of magmatic origin.

Serpentinities of Dağardı melange and crystallized limestones of Budağan limestone were hydrothermally altered by hydrothermal solutions, come from fissures and fractures due to tectonic movement during the thrust of melange and occurred silicified zone. Gürkuyu Sb mineralization suggest that occurred in this silicified zone.

Keywords: *Stable isotope, Gürkuyu, Sb mineralization, Gediz, Kütahya, NW Turkey*

**Depositional Environment According to Rare Earth Elements (REE)
content of Hançili Formation Interbedded Oil Shale and Coal in
Dodurga Basin (Çorum- TURKIYE)**

SARI A.¹, YAVUZ PEHLİVANLI B.²

¹Ankara University, Department of Geological Engineering, Tandoğan 06100, Ankara, Turkey

²Bozok University, Faculty of Engineering and Architecture Geological Engineering
Department,66100, Yozgat, bernayavuz80@gmail.com

Dodurga basin (Çorum) is one of the most important oil shale basin in Turkey (138 million tons probable reserves). In the study area are Late Cretaceous, Early Paleocen, Late Eocene, Early Oligocene, Late Oligocene, Miocene, Pliocene and Quaternary aged units. Miocene aged Hançili Formation consisted of Claystone, marl, organic matter rich claystone, fossiliferous limestone, oil shale, oil-marn and coal interbedded (400 m). The total organic carbon (TOC) contents of Miocene Hançili Formation oil shales and coals interbedded vary between 6 and 38% that have very good source rock potential. The total rare earth element (Σ REE) contents in Hançili Formation samples are average 63.07 μ g/g (from 8,11 to 137,5; n=30). PAAS was used for the normalization. PAAS normalized samples pattern shows negative Ce anomaly, a positive Eu anomaly, and an enrichment of MREEs. The REE contents and characteristics in samples are showed low oxygenated and anaerobic (reducing) conditions of the depositional environment.

Keywords: *Depositional environment, Rare earth elements (REE), Dodurga basin (Corum)*

Production Cross-Section of Medical ^{177}Lu Using Neutron and Proton Induced Reactions

ŞEKERCİ M¹., ÇAPALI V¹., ÖZDOĞAN H²., KAPLAN A.¹

¹Süleyman Demirel University, Isparta, Turkey, mertsekerici@sdu.edu.tr

²Akdeniz University, Antalya, Turkey, hasanozdogan@akdeniz.edu.tr

Scientists have developed different methods of cancer therapy to treat different types of cancers such as chemotherapy, radiation therapy, immunotherapy, hyperthermia and photodynamic therapy etc. The most known type of cancer therapy is radiation therapy in where radioisotopes used. In last years, ^{177}Lu peptide compound using in radionuclide therapy applications are increasing because of the obtained successful clinical results in treatment of stomach, intestine, pancreas and breathing system cancers. The most common way to produce ^{177}Lu radionuclide isotope is either by directly $^{176}\text{Lu} (n,\gamma)^{177}\text{Lu}$ reaction or by beta emitting of ^{177}Yb after $^{176}\text{Yb} (n,\gamma)^{177}\text{Yb}$ reaction. Besides of these routes of producing ^{177}Lu , there may be different types of reactions for obtaining ^{177}Lu . In this study, we aim to investigate the alternative ways to produce ^{177}Lu . For this purpose; we analyzed $^{176}\text{Lu} (n,\gamma)^{177}\text{Lu}$, $^{176}\text{Yb} (n,\gamma)^{177}\text{Yb}^{\beta-177}\text{Lu}$, $^{181}\text{Ta} (n,n+\alpha)^{177-\text{M}}\text{Lu}$, $^{\text{nat}}\text{W} (p,x)^{177}\text{Lu}$ reactions with the TALYS 1.6 and EMPIRE 3.2 theoretical nuclear reaction codes. Obtained results with the TALYS and EMPIRE codes are also analyzed with the experimental data exists in the literature for each reaction.

Keywords: ^{177}Lu , Cross Section, TALYS 1.6, EMPIRE 3.2.

