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12th International Conference of Nuclear Sciences & Applications

Book of abstracts

Organized by
The Egyptian Society of Nuclear Sciences and Applications (ESNSA)

To be Held at
Hurghada – Egypt
Caribbean World Resort, Soma Bay
15 -18 February 2020

12th INTERNATIONAL CONFERENCE OF NUCLEAR SCIENCES AND APPLICATIONS

and
Third IRPA-EGYPT Radiation Protection Workshop

Book of abstract

Organized by

The Egyptian Society of Nuclear Sciences and Applications (ESNSA)

Member of the International Nuclear Societies Council (INSC)

The Egyptian Atomic Energy Authority (EAEA)

February (15-18), 2020

Hurghada, Red Sea, Egypt, Caribbean World Resort, Soma Bay

Preamble

The Egyptian Society of Nuclear Sciences and Applications (ESNSA)

Organizes an international conference every four years that deals with the current activities in nuclear sciences and applications. It aims at providing a forum for exchange of knowledge in the interdisciplinary fields of nuclear sciences and their applications.

The conference scientific activities will include invited talks and keynote presentations by international and national recognized scientists to highlight recent progress in nuclear sciences, as well as contributed papers dealing with ongoing research

Honorary Chairman, Prof. Dr. Atef A. Abdel Fattah
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Acknowledgement

The conference organizing committee expresses gratitude for the financial support of the following organizations:

- **Rosatom State Atomic Energy Corporation**. (**Russian Federation**)
- **Amnesty Recovery Program** (**Prof. Dr. Yasser Tawfik**).
- **Consultation and Radiation Protection Services Project** (**Dr. Talaat Salah El–Din**).
- **Amale Company** (**Prof.Dr. Glal El–Syad**).
- **SATCO Company** (**Late Prof.Dr. Hussein Abou Lela**).
- **Egyptian Syndicate of Scientific Professions**.
- (**Late Prof.Dr. Anas El–Naggar**).
- **Arabic Chemical Consulting Center**.
- **4S Sphinx Company**.

ESNSA Conference Awards

Prizes shall be awarded to distinguished presentations from junior scientists participating in the conference.

The prizes are awarded by:

- **Prof. Mahmoud Ali Ashour**, **NCRRT**, **EAEA**.
- **Late Prof. Farouk Mustafa Awad**, **NRC**, **EAEA**.

The award of Prof. Dr. Tomader El–Khalalfawy will be announced in the closing session.

Time Table

Saturday 15/2/2020			
Time	**Hall (A)**		
7:00 – 12:00	**Traveling to Hurghada by Bus**		
12:00 – 13:00	**Accommodation**		
Lunch Break			
16:00 – 16:30	**Registration**		
16:30 – 17:30	**Opening ceremony**		
17:30 – 19:00	**Invited Talks** **(Rosatom Co. – Amanda Pourciau)**		

Sunday 16/2/2020			
Breakfast			
10:00 – 10:30	**Hall (A)**		
	Invited Talks **(Mekki Soufiane)**		
10:30 – 12:30	**Hall (A)**	**Hall (B)**	**Hall (C)**
	Nuclear Analytical Techniques	**Isotope Production**	**Nuclear Reactors (1)**
Lunch Break			
15:00 – 17:00	**Hall (A)**	**Hall (B)**	**Hall (C)**
	Material Science	**Radio Chemistry (1)**	**Nuclear Reactors (2)**
17:00 – 17:30	**Coffee Break**		
17:30 – 19:30	**Hall (A)**	**Hall (B)**	**Hall (C)**
	Nuclear Physics	**Polymer Science**	**Radio Chemistry (2)**
Dinner			

Monday 17/2/2020			
Breakfast			
9:30 – 10:00	Hall (A)		
	Invited Talks **(M. N. H. Comsan)**		
10:00 – 12:00	**Hall (A)**	**Hall (B)**	**Hall (C)**
	Radiation Protection (Work Shop)	**Nuclear Safety**	**Waste Management (Work Shop)**
Lunch Break			
Time	**Hall (A)**		
15:00 – 17:00	Posters Session		
17:00 – 18:00	Closing Cermony		
Dinner			

Thursday 18/2/2020	
7:00 – 10:00	Breakfast
10:00 – 16:00	Departure to Cairo by Bus

Saturday

15/2/2020

Opening Ceremony

Saturday 15/2/2020

16:30 – 17:30

Invited Talks

Hall (A)

Saturday 15/2/2020

Chairmen :

Prof. Dr. H. F. Aly **Prof. Dr. Atef A. Abdel Fattah**

1) Invited Talks 17:30 - 19:00 pm:

No.	Time	Title	Speaker
1	**17:30 - 18:15**	**Power Reactors**	**ROSATOM Co.**
2	**18:15 - 19:00**	**Office of Radiological Security program, The Department of Energy, USA**	**Amanda Pourciau**

Sunday

16/2/2020

Invited Talks

Hall (A)

Sunday 16/2/2020

Chairmen :

Prof. Dr. H. F. Aly **Prof. Dr. Yasser Tawfik**

2) Invited Talks 9:30 - 10:30 pm:

No.	Time	Title	Speaker
1	**10:00 - 10:30**	**Radioactive Waste Management, the French Experience**	**Mekki Soufiane**

Sunday 16/2/2020

Chairmen:

Prof. Dr. Farid Abou El-Nour **Prof. Dr. Abdel Shafy Ragab**

Hall (A)

3) Nuclear Analytical Techniques 10:30 - 12:30

No.	Time	Title	Speaker
1	**10:30 - 10:45**	**Assessment of U Concentration in Granitic Rocks in Egypt Using γ–Ray Spectroscopic Analysis as NTDs** E. H. Ghanim, Kh. A. Shinashin, A. Hussein and M. A. El Fiki	**E. H. Ghanim**
2	**10:45 - 11:00**	**Microanalysis and Signature of Rare Earth Elements in Geochemical Samples Using Neutron Activation Analysis** M.F. Attallah, Fatma S. Abdou, and H.F. Aly	**M.F. Attallah**
3	**11:00 - 11:15**	**Use of Scientific Techniques to Determine the Causes of Deterioration in Queen Nodjmet Mummy (case study)** Samia El-Merghani	**Samia El-Merghani**
4	**11:15 - 11:30**	**Characterization of Egyptian Human Renal Stones Using Chemical and Radiochemical Techniques** Fatma H. El-Sweify, Reham A. Hatab, Mohamed Ali, and Wafaa S. Hegazy	**Fatma H. El-Sweify**
5	**11:30 - 11:45**	**Quantitative Approach to Groundwater Dating with Tritium** Moustafa,W.M and Abou El-Nour,F.H	**Abou El-Nour,F.H**
6	**11:45 - 12:00**	**Productivity of Wheat Crop as Affected by Gamma Rays and Different Nitrogen Levels.** Ahmed, A. Moursy and Ismail, M.M	**Ismail, M.M**
7	**12:00 - 12:15**	**Wheat Production Affected by Different Fertilization Types Using N–15 Stable Isotope.** Ismail, M.M and Ahmed, A. Moursy	**Ahmed, A. Moursy**

Assessment of U and Th concentration in Granitic Rocks in Egypt Using γ–ray Spectroscopic Analysis with NTDs

E. H. Ghanim[1*], Kh. A. Shinashin[2], A. Hussein[3] and M. A. El Fiki[4]

(1) Basic Sciences Department, Faculty of Industrial Education, Beni-Suef University, Beni-Suef, Egypt

(2) Physics Department, Faculty of Science, Port Said University, Port Said, Egypt

(3) Physics Department, Faculty of Science, Menoufiya University, Shibeen El Koom, Egypt

(4) Radiation Measurements Lab, Ionizing Radiation Department, National Institute for Standards (NIS), Egypt

ABSTRACT

The determination of both uranium and thorium contents in natural granite rocks was carried out without the need of standard sources. A combined technique of nuclear track density counting system and gamma spectroscopic analysis has proved to be an adequate and reliable technique for U and Th determination in natural crustal samples. Results of U and Th analysis showed that in Gabal El-Massakat region, U content ranges from 78 to 588 ppm and Th content ranges from 15 to 130 ppm. In El-Eradyia area U content varies from 55 to 94 ppm and Th from 10 to 230 ppm. Also, measurements of radon gas emanating from the studied samples were also included using a specially constructed chamber. An overall estimation of radon concentration using some of the studied samples show that Rn concentration in Gabal El-Massakat area ranges from 645 to 1088 pCi /1 while for the samples collected from Gabal El-Majal area ranges from 4 to 27 pCi/1. Results are discussed within the frame work of track formation theories and etching mechanism in nuclear track detectors and γ–ray spectroscopic analysis.

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Microanalysis and Signature of Rare Earth Elements in Geochemical Samples Using Neutron Activation Analysis

M.F. Attallah[1], Fatma S. Abdou[2], H.F. Aly[3]

[(1)]Analytical Chemistry and Control Department, Hot Laboratories Center, Atomic Energy Authority, Egypt

[(2)]Egypt Second Research Reactor, Reactor Physics Department, Nuclear Research Center, Atomic Energy Authority, Egypt

[(3)]Chemistry of Nuclear Fuel Department, Hot Laboratories Center, Atomic Energy Authority, Egypt

ABSTRACT

Nuclear techniques are applied for exploration and efficient tapping of natural resources, by finding promising resources of mining and mineral processing industries. A number of minerals are existing in the Nuba Mountains. Fluorite occurs in various locations. Fluorites in the Nuba Mountains are classified into four categories based on their petrography. The rare earth elements (REEs) geochemistry in four fluorites samples, collected from Nuba Mountains are determined using neutron activation analysis technique. The REEs concentration ranges between 685 and 1747 ppm. The Calcium is a major element in the four samples. The Fe, Al, Na, Ba and Sr are found as minor elements in the investigated samples. In addition, tracer levels of U, Th, Cs, V and Sc are also detected. The signature of Ce, La and Nd as light REEs is characterized in all samples under this study. The enrichment types of (L-, M-type) and several distinct features of some REEs e.g., Ce and Eu anomalies are identified and described the signature of REEs in the geochemical samples. These results are demonstrated as promising materials that could be used for metallurgy processing to get significant amounts of REEs.

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Using Scientific Techniques to Determine the Causes of Deterioration in Queen Nodjmet Mummy (a case study)

Samia El-Merghani

physical Anthropology, and conservator of mummies in Ministry *of Tourism and Antiquities*

ABSTRACT

Mummies are considered the most attractive and most sensitive organic artifacts in Egyptian antiquities. From conservation view, a great variety in mummification techniques and materials were found to be used through times and other variety within each period according to the social level of the mummy's owner. To determine the causes of deterioration, the external and internal factors that may cause deterioration should be investigated. The external factors include all microclimate surround the mummy and showcase/place of store. The external factor such as the dating of the mummy and the materials used of embalming should be available. Each case is different, so it is important to take sample/ swabs from the deteriorated areas for microscopic examination and to perform the necessary analyses to identify the causes of damage and to develop the treatment plan, then doing possible experiments before starting treatment on the mummy.

In this paper, the case study of the queen Nedjemet mummy is demonstrated and the causes of damage are defined using scientific analysis and applying suitable treatment. Good results are obtained and the conservation state is stable until now.

Characterization of Egyptian Human Renal Stones Using Chemical and Radiochemical Techniques

Fatma H. El-Sweify*, Reham A. Hatab, Mohamed Ali, Wafaa S. Hegazy

Hot Laboratories and Waste Management Center, Atomic Energy Authority, Egypt

ABSTRACT

Recently, the incidence rate of renal stone disease is increased in Egypt. In addition to industrial and environmental effects, trace elements may also have a role in the formation of such stones in spite of their significance in biological lithogenesis. In this study, instrumental neutron activation analysis (INAA) technique is applied for elemental analysis of some renal stones, collected from patients living in different provinces in Egypt. The samples are collected from males, females and children, of different ages. The analyses are carried out under various conditions of irradiation and cooling time. Major, minor and trace elements are determined.

The analyzed elements are: As, Br, Ca, Co, Cr, Cu, Fe, Hf, In, Mg, Mn, Na, Se, Sr, Tb, V and Zn. Some of these elements are biologically essential and others are dangerous or toxic.

Firstly, 130 biological stone sample, from Al-Matrya National Institute of kidney and urinary tract at Cairo, have been obtained from patients of different genders and ages and living in different locations. The analysis and investigations carried out on the collected stones are directed to characterize these stones.

The physicochemical analysis is carried out to determine the density of the stones and to study the effect of some organic solvent and inorganic acids on the dissolution and decomposition of the different stones. The pneumatic irradiation rabbit system (PIRS) built in the vertical thermal column of the ET-RR-2 reactor is used for short time (200 seconds) irradiation at 19 MW power.

A Quantitative Approach to Groundwater Dating with Tritium

W.M. Moustafa[a], and F.H Abou El-Nour [b*]

[(a)]Egyptian Nuclear Regularity and Radiation Authority (ENRRA), Egypt

[(b)]Nuclear Chemistry Department, Hot Laboratories Center, Atomic Energy Authority, Egypt

ABSTRACT

The age of groundwater represents an important factor for water resources management. Tritium as a radioactive isotope of hydrogen, with a half-life of 12.32 years and a mass of 3.01605 atomic mass unit (amu), becomes a standard for the definition of modern groundwater. The thermonuclear bomb testing in the atmosphere, from May 1951 to 1976, provided the tritium input signal that defines modern water. Its decay from natural pre-bomb levels is such that it cannot normally be detected in groundwater recharged before 1950. Modern groundwater is then younger than about 45 years relative to the mid-1990s. Tritium-free groundwater is considered "sub modern" or older.

Isotope hydrology have been applied to investigate water resources, interconnection between different aquifers, relationship between surface and groundwater as well as recharge direction. Besides, the source, quantity and transport of pollutants, moisture and isotope fluxes in present and past climate systems could be deduced. It is motivated by new and emerging interests in transit time estimation. In this paper, the methods available to estimate groundwater transit time are discussed and a formal listing of sampling, aging and interpretation issues concerning the development and assessment of water resources are derived. Ground and surface water collected from Nile-Delta and Greater Cairo aquifers to be used for drinking purposes were analyzed for tritium content, mean residence time, salinity and conductivity. The experimental results were analyzed, compared to each other, discussed and indicated the suitability of most of these aquifers for drinking purposes, while others for irrigation.

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Productivity of Wheat Crop as Affected by Gamma Rays and Different Nitrogen Levels

Ahmed, A. Moursy and Ismail, M.M

Soil & Water

Research Department , Nuclear Research Center, Atomic Energy Authority, Egypt

ABSTRACT

An experiment was conducted at the Soils and Water Research Department, Nuclear Research Center, Atomic Energy Authority, Inshas, Egypt, to study the effect of gamma radiation at different doses (zero Gy, 40, 80 and 160 Gy) on growth and yield of wheat fertilized with 0.0, 50 and 100 N kg fed^{-1} as urea fertilizer. Nitrogen unites was applied in split doses at sowing and beginning flowering stages with P and K in the form of normal super-phosphate and potassium sulphate as a basal single dose. The experiment was laid out in randomized complete block design in three replicates. Results revealed that straw and grains yield were significantly fluctuated between the increase and decrease. Furthermore, under 80 Gy gamma rays, the highest value was 15.7 kg $plot^{-1}$, observed at rate of 100 kg N fed^{-1}+ 80Gy, grains increased compared to all treatments and the control. Under gamma rays, the highest values of straw and grains were 9.9 kg $plot^{-1}$ and 15.7 kg $plot^{-1}$ **,** observed at a rate of 100 kg fed^{-1} plus doses of 40 and 80 Gy radiation respectively. The data indicated that N uptake by straw and grains, in non-irradiated treatments, significantly increased with increasing the doses of nitrogen fertilizer levels 100 kg N fed^{-1} and gamma rays dose up to 80 Gy. Moreover, the highest N uptake of 98.3 g $plot^{-1}$ and 181.1 g $plot^{-1}$were observed at a rate of 100 kg N fed^{-1} + zero Gy, compared to the control, whereas, under a dose of 80 Gy , the highest values of N uptake were 120.1 g $plot^{-1}$ and 195 g $plot^{-1}$ which recorded with straw weight and grains yield, respectively.

Wheat Production Affected by Different Firtilization Types Using ^{15}n – Stable Isotope

Ismail, M.M and Ahmed, A. Moursy

Soil & Water Research Department, Nuclear Research Center, Atomic Energy Authority, Egypt

ABSTRACT

A field experiment was carried out to study growth and yield of wheat grown on sandy soil as affected by different N sources using ^{15}N tracer. Results revealed that an observed markedly increase in weights of straw and grains of wheat in the plot amended with compost at rate of (50%MF + 50% OM) ratio. The increase relatively recorded 66.44% and 66.60% over the control for straw and grains, respectively. For N-uptake, an observed markedly increase in the values of N uptake by straw and grains. The increase relatively recorded 84.52% and 99.60%, respectively over the control. The highest values of Ndff% was 52.9% recorded in the plot amended with chickpea straw and was 52.1% as recorded with cow manure treatment at rates of (50% MF + 50% OM) and (75% MF + 25% OM) ratios. The highest values of Ndfo% were 57.4% with cow manure treatment at a rate of (50% MF + 50% OM) for straw of wheat and 58.4% with compost treatment at a rate of (50% MF + 50% OM) for grains of wheat.

Sunday 16/2/2020

Chairmen:

Prof. Dr. Ghada I Eisa **Prof. Dr. Nabil Belacy**

Hall (B)

4) Isotope Production 10:30 - 12:30

No.	Time	Title	Speaker
1	**10:30 - 11:00**	**Evaluation of New-Modelled recombinant Human Insulin (rh Insulin) Analog Expressed in E.coli Using Radioiodination Technique Followed by in Vivo Biodistribution in Diabetes Induced Mice.** Gamal AbdelAziz, Ibrahim.Y. AbdelGhany and Nasser. Farouk	**Gamal AbdelAziz**
2	**11:00 - 11:30**	**Accurate Calculations for ^{99}mTc Eluted From ^{99}Mo/^{99}mTc Generators at Different Elution and Measurement Times** M. Mostafa	**M. Mostafa**
3	**11:30 - 12:00**	**Technetium-99m Kits, The Back Bone of the Radiopharmaceuticals:** **Optimized Preparation and Bio-Evaluation** Abeer Mohamed Amin	**Abeer Mohamed Amin**
4	**12:00 - 12:30**	**^{99}Mo/^{99}m Tc Radioisotopes Generators: Concept, Preparation and Application** M.A. El-Amir	**M.A. El-Amir**

Evaluation of New-Modelled Recombinant Human Insulin (rh Insulin) Analog Expressed in *E.coli* Using Radioiodination Technique Followed by *In Vivo* Biodistribution in Diabetes Induced Mice

Gamal AbdelAziz*, Ibrahim.Y. AbdelGhany, Nasser. Farouk

(1)Radiolabeled Compounds Department, Hot Laboratories Center, Egyptian Atomic Energy Authority, Egypt

ABSTRACT

Many biological techniques are used by biologists to determine biological nature and physiological activity of new mammalian proteins produced by recombinant DNA technology. Methods such as SDS-PAGE, western blot, ELISA and flow cytometry are commonly used, although these methods are considered to be of high cost and almost with comparatively low efficiency, Therefore, the present research focuses on real-time studying the physiological activity of new modelled recombinant human insulin produced in *E.coli* by studying its Biodistribution after radiolabeling with ^{125}I in mice with induced diabetes. Radioiodination takes place for five-tyrosine residue in the structure of human insulin using the electrophilic substitution moiety, followed by optimizing the reaction by studying reaction factors including amount of substrate, chloramine-T amount, pH, temperature and reaction time, in order to reach a high radiochemical yield of 99.01 ±0.2%. Previously induced Albino Swiss mice with diabetes using streptozotocin (STZ) have treated with ^{125}I - insulin to study the physiological activity and biological functionality of the produced recombinant human insulin by studying its biodistribution behavior in diabetic mice. Results showed that The radioactive complex of ^{125}I - Insulin gives much better result after IV injection in diabetic mice, where no accumulation in distinct organ. An obvious reduction of glucose levels has been shown in mice blood, also clearance from both renal and hepatic route due to aqueous nature of insulin, Also prevalence of insulin in body according every organs mass or size, has a great impact of functionality of recombinant insulin molecule. Consequently, this method seems to be much rapid and effective for evaluation of biological molecule *in vivo* via radioactive tracing technique.

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Accurate Calculations for ^{99m}Tc Eluted from ^{99}Mo/^{99m}Tc Generators at Different Elution and Measurement Times

M. Mostafa

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ABSTRACT

It is known that the radioactive growth-decay of ^{99m}Tc as a daughter of ^{99}Mo follows a transient equilibrium, which is attained after ~ 23 h. Routine production of ^{99}Mo/^{99m}Tc generators based on alumina requires a valid calculation model to predict the eluted activity of ^{99m}Tc on calibration date, from the measured eluted ^{99m}Tc activity at any time between production and calibration dates. Time elapsed between: (i) conditioning and elution and (ii) elution and measurement should be taken into account. The article discusses the issue of using the approximation used after attaining equilibrium and its effect on the accuracy of calculations. A Table is presented compiling '^{99m}Tc eluted fraction/eluted ^{99m}Tc at t_{max}' ratio against different elution times which includes short time increments for more convenience and accuracy.

Technetium-99m Kits, The Black Horse of the Radiopharmaceuticals: Optimized Preparation and Bio-evaluation

Abeer Mohamed Amin
Labeled Compound Department, Radioisotopes Production Division, Hot Laboratories Center, Atomic Energy Authority, Egypt

ABSTRACT

The widespread use of ^{99m}Tc-radiopharmaceuticals depends on availability of entirely pharmaceutical grade generators and the development of new ^{99m}Tc radiotracers, with novel drug having more favorable pharmacokinetic characteristics. Radiolabeling allows noninvasive imaging by single photon emission computed tomography (SPECT) or positron emission tomography (PET) for assessing the biodistribution of novel drugs. The efficacy of a radiopharmaceutical is determined by the type of ligand that it consists of, as well as the radionuclide that is incorporated in tracer amounts. The ligand may be an inorganic or organic molecule, a peptide, an antibody or a more complex chemical structure with the ability to accumulate in a pathological site in order to act diagnostically or therapeutically. The type of emission of the radionuclide attached to the carrier gives the diagnostic or therapeutic character to the radiopharmaceutical. An ideal radiopharmaceutical should concentrate in the tumor area in order to afford the required result, with minimum radiation dose to healthy tissues. ^{99m}Tc is one of the most commonly used radionuclides for clinical SPECT imaging. Radiolabeled drugs can also be used as tools for the estimation of novel drug pharmacokinetics in vivo. More specifically, accurate quantification of the amount of the labeled ligand in each organ, as well as simultaneous visualization of its route in vivo, can be determined

$^{99}Mo/^{99m}$ Tc Radioisotopes Generators: Concept, Preparation and Application

M.A. El-Amir

Radioisotopes Production Department, Hot Laboratories and Waste Management Center

(HLWMC), Atomic Energy Authority, Egypt

ABSTRACT

Radionuclide generator systems continue to play a key role in providing both diagnostic and therapeutic radionuclides for various applications in nuclear medicine, oncology, and interventional cardiology. A radionuclide generator is a concept defined as an effective radiochemical separation of decaying parent and daughter radionuclides such that the daughter is obtained in a pure radionuclidic and radiochemical form. Radionuclide generators were historically called ‘‘cows’’ since the daughter radioactivity was ‘‘milked’’ (i.e., removed) from its precursor and the parent then generated a fresh supply of the daughter. Although many parent/daughter pairs have been evaluated as radionuclide generator systems, there is relatively small number of generators, which are currently in routine clinical and research use. Essentially every conceivable approach has been used for parent/separation strategies, including sublimation, thermo chromatographic separation, solvent extraction, and adsorptive column chromatography.

The $^{99}Mo/^{99m}Tc$ generator system is the most widely used radionuclide generator for clinical applications.

Sunday 16/2/2020

Chairmen:

Prof. Dr. Nuno Pessoa-Barradas **Prof. Dr. David Sears**

Hall (c)

5) Nuclear Reactors (1) 10:30 - 12:30

No.	Time	Title	Speaker
1	**10:30 - 10:45**	**Reactor Applications** Nuno Pessoa-Barradas	**Nuno Pessoa-Barradas**
2	**10:45 - 11:00**	**Feasibility Studies for the Implementation of Epithermal NAA at GHARR-1** Bernard Osei	**Bernard Osei**
3	**11:00 - 11:15**	**Production of Radiocarbon with MNSR Type Reactor** Muhammad Tukur , Yusuf Aminu Ahmed, Mark O.A. Oladipo, Abdulmuminu A. Nuhu , Ibrahim Hamisu , Hadi Nur and Izyan Hazwani bint Hashim	**Muhammad Tukur**
4	**11:15 - 11:30**	**Optical and Structural Enhancement of Neutron Irradiated Epoxy Resin Films Comparative to Mixed Neutron-Gamma Irradiation in French CEA Reactors** Amel Raouafi, Walid Dridi, Mahmoud Daoudi, and Faouzi Hosni	**Mr. Raouafi Amel**
5	**11:30 - 11:45**	**Neutron Heating Measurement in a Mixed (n/γ) Field in Minerve Research Reactor** Fadi Rouihem, Walid Dridi and Faouzi Hosni	**Fadi Rouihem**
6	**11:45 - 12:00**	**Thermal Hydraulic Analysis of Uranium Target Plate for Molybdenium-99 Production** M'hamed Salhi, Sayah Missaoui, Salah Hanini, Brahim Mohammedi, Nacim Mellal	**Nacim Mellal**
7	**12:00 - 12:15**	**Implementation of a Research Reactor in Senegal** Cheikh Niane	**Cheikh Niane**

Feasibility Studies for the Implementation of Epithermal NAA at GHARR-1

Bernard Osei

National Nuclear Research Institute, Ghana Atomic Energy Commission.

ABSTRACT

In terms of utilization, the Ghana Research Reactor-1 (GHARR-1) facility is mainly utilized for Neutron Activation Analysis (NAA). Throughout its years of operation, GHARR-1 makes use of conventional NAA. Even though this type (variety) of NAA is useful in analysing a wide range of elements, other varieties of NAA when employed will increase the scope of elements that are analysed at the facility. This paper presents the results of the feasibility studies with respect to neutronics carried out for the implementation of epithermal NAA at the GHARR-1 centre using the Monte Carlo N-Particle code. For this variety of NAA samples are shielded from neutrons in the thermal energy range and thus activated by epithermal neutrons. Epithermal NAA not only expands the number of elements that can be analysed but also allows for better sensitivities and increased precision in quantifying elements.

Production of Radiocarbon with MNSR Type Reactor

Muhammad Tukur [a], Yusuf Aminu Ahmed [a], Mark O.A. Oladipo [a], Abdulmuminu A. Nuhu [b], Ibrahim Hamisu [b], Hadi Nur [c], Izyan Hazwani bint Hashim [d]

[(a)] Center for Energy Research and Training, Ahmadu Bello University Zaria, Nigeria
[(b)] Chemistry Department, Ahmadu Bello University Zaria, Nigeria
[(c)] Chemistry Department, Universiti Teknologi Malaysia, Johor Bahru, Malaysia
[(d)] Physics Department, Universiti Teknologi Malaysia, Johor Bahru, Malaysia

Neutron irradiation of Nitrogen-14 to yield Carbon-14 via n,p nuclear reaction was utilized for isotope production at Nigerian Research Reactor-1 (NIRR-1). The reactor is a Chinese design and produced Miniature Neutron Source Reactor (MNSR) typically characterized with stable neutron flux and high Thermal neutron ratio. A variety of Nitrogenous target (Diphenyl Amine, Thioacetamide, Hydrazine Sulphate and Ammonium Nitrate) were chosen to represent organic and inorganic compounds; different oxidation state of Nitrogen, covalent and ionic bonding, presence and absence of neutron activated elements and other properties. Irradiation time ranges from 90 to 360 minutes. High temperature oxidation of the irradiated sample and Carbon capture with Perkin Elmer Carbosorp prior to liquid scintillation counting ensues quench free Carbon-14 solution which yield activity ranging from 100 to 14,000 dpm per gram of sample. Diamond crystal solid sample ATR-FTIR shows the decrease in intensity with the increase in irradiation time for Nitrogen-compounds peaks and the also appearance of new Carbon-compound peaks. While solution FTIR also reveals a similar trend to solids FTIR, it fails to reveal new carbon compound peaks. The observation suggests hot atom chemistry resulting from excess recoil energy of n,p reaction taking place in solution and not in solid samples. The low power and limited irradiation duration of MNSR's poses a challenge in its application for isotope production. However, the relatively high cross section of 14N(n, p)14C reaction with low energy neutrons coupled with activity yield obtained makes MNSR an ideal tool for radiocarbon production.

Optical and Structural Enhancement of Neutron Irradiated Epoxy Resin Films Comparative to Mixed Neutron-Gamma Irradiation in French CEA Reactors

Amel Raouafi*, Walid Dridi, Mahmoud Daoudi, Faouzi Hosni
Laboratoire de Recherche en Energie et Matière pour le Développement des Sciences Nucléaires, (LR16CNSTN02)
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ABSTRACT

The present work reports the comparison between the optical properties of epoxy resin films irradiated by two different reactors. Epoxy resin films were irradiated with different doses by Nuclear reactors; MINERVE reactor in Cadarache and Orphee reactor in Saclay. After exposure to mixed neutron-gamma irradiation (MNGR), the optical properties are a little improved. But with neutron irradiation, we note a significant improvement. The difference between the two various irradiation types are also considered for the structural properties. The neutron irradiation of Epoxy resin films produces noticeable structural change. However, with mixed neutron-gamma irradiation, we note a structural stabilization. The obtained results revealed that neutron irradiation has a greater influence than irradiation with mixed neutron-gamma.

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Neutron Heating Measurement in a Mixed (n/γ) field in Minerve Research Reactor

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ABSTRACT

The National Center of Nuclear Science and Technology of Tunisia (CNSTN) has signed in 2016 an International Center based on Research Reactors (ICERR) agreement for sending affiliate staff to the French Alternative Energies and Atomic Energy Commission (CEA). Through its research centers of Saclay and Cadarache, CEA was designated as an International Center based on Research Reactors. In this project, the neutron dose in the UO2 core of the MINERVE facility was deterined using ESR measurements and Monte Carlo simulations. A batch of alanine pellets was introduced into aluminum cans as cavity material at the center of the reactor. Alanine dosimeters were introduced into an aluminum pillbox to achieve charged-particle equilibrium condition (CPE). This study made it possible to measure the neutron dose by correcting the total measured dose using calibration cavity factor and then by subtracting the gamma dose. Usually, the measurements need to be accompanied by Monte Carlo calculation to validate the method and to better understand the neutron contribution. This attempt led to underestimating the neutron dose rate when compared to the experimental results with a calculation versus experiment (C/E) value of about $0.96 \pm 10.83\%$ ($k = 1$).

Thermal Hydraulic Analysis of Uranium Target Plate for Molybdenium-99 Production

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ABSTRACT

Technicium-99m is a radiopharmaceutical element used in nuclear medicine as diagnostic tool. It is obtained from the radioisotope molybednium-99. Almost the total production of molybdenium-99, with high specific activity, is obtained, from irradiation of uranium target in nuclear reactor, by nuclear fission reaction. Fission Moly production passes through three phases, irradiation, decay radiation and the transfer period from the reactor to chemical process. The irradiation phase requires adequate cooling in order to extract nuclear heat generated in uranium target and to ensure that the irradiation conditions are below thermal margins and safety limits.

The paper presents a thermal hydraulic analysis behavior of low enrichment uranium target plate for molybdenium-99 production using CFD method. The results obtained are below thermal margins and slight discrepancies are observed with results calculated by TMAP code developed by KAERI team.

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Implementation of a Research Reactor in Senegal

Cheikh Niane
National Committee for the Research Reactor project, Dakar, Senegal

ABSTRACT

Senegal established in 2018-2019 a technical cooperation project with the IAEA entitled "Developing a National Nuclear Infrastructure for Establishing a Research Reactor". The objectives of the project were to develop regulations and prerequisites for establishing a research reactor and a nuclear power plant in Senegal.

The expected outcomes are the establishment of a research reactor for radioisotopes production, Neutron activation analysis (NAA), Research and Development and the training of personnel for implementing the project.

Stakeholders involved in the project are:

- The Ministry of Petroleum and Energy;
- The Ministry of Higher Education and Research, which will undertake coordination of cooperation with the IAEA and the promotion of scientific research in Senegal;
- The Ministry of Environment and Sustainable Development, which will prepare and implement government policy to combat pollution and protect nature;
- The Ministry of health;
- Cheikh Anta Diop University;
- The National Electricity Company, which is responsible for energy production, transportation and distribution;
- The Institute of Applied Nuclear Technology, which will coordinate all nuclear research activities; and
- The regulatory body, Radiation Protection and Nuclear Safety Authority, which is responsible for the general implementation of the government policy for radiation protection and nuclear safety; its mission revolves around three main objectives — regulation, monitoring and public information.

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Sunday 16/2/2020

Chairmen:

Prof. Dr. Osama Hemeda **Prof. Dr. Abdelwahab Elsayed**

Hall (A)

6) Materials Science 15:00 - 17:00

No.	Time	Title	Speaker
1	**15:00 - 15:20**	**Enhancement of Magnetic Properties of PVDF by Synthesize of NiZn Ferrite- Polymer Nano Composite Films for Industrial Applications** Osama Mohamed Hemeda	**Osama Hemeda**
2	**15:20 - 15:40**	**Synthesis, Electric and Magnetic Characterization of Nickel Ferrite/PANI Nano-Composite Prepared by Flash Auto Combustion Method** A.M. A. Henaish, M. M. Ali and D.E. El Refaay	**M. M. Ali**
3	**15:40 - 16:00**	**Effect of Reduced Particle Size on the Structural and Physical Properties of $CoFe_2O_4$ Nanoparticles** T.M. Ali, S. M. Ismail, S.F.Mansour, M.A.Abdo and M. Yehia	**T.M. Ali**
4	**16:00 - 16:20**	**Effect of Silver Nanoparticles on the Properties of Cobalt Ferrites** M. Kaiser	**M. Kaiser**
5	**16:20 - 16:40**	**Effect of Pre-Irradiation Treatment in the Calculation of Bulk Etching Rate** M. S. El -Nagdy , I. G. Saqr , A. Mater , A. I. Abd El-Hafez and N. A. El-Faramawy	**M. S. El -Nagdy**

Enhancement of Magnetic Properties of PVDF by Synthesizing NiZn Ferrite-Polymer Nano Composite Films for Industrial Applications

Osama Mohamed Mahmoud Hemeda

Physics Department, Faculty of Science, Tanta University, Egypt

ABSTRACT

$Ni_{0.5}Zn_{0.5}Fe_2O_4$ were prepared using the ball milling technique for 41, 67 and 90 hours and were annealed at 1073, 1273 and 1373 K .The composite samples of (x)$Ni_{0.5}Zn_{0.5}Fe_2O_4$ /(1-x)PVDF, (x%= 5, 10, 15, 20 and 25%) have been prepared by casting method. The non polarized α phase of PVDF decreases and the polarized β-phases increase by increasing the ferrite content suggesting less crystallinity and producing an amorphous structure of PVDF at x=25% ferrite content. The electric polarization increases by increasing NZF content. The transition from ferromagnetic (order state) to paramagnetic (disorder state) occurs at Curie temperature T_C around (600K). The DC resistivity is nearly constant from 153k to 286k for all composite samples and then decreases at high temperature. The behavior of dielectric constant and dielectric loss was measured in the temperature ranging from 200K to 700K. With the increase of the magnetic content, the saturation magnetization (Ms) value of the composites also increases.

Synthesis, Electric and Magnetic Characterization of Nickel Ferrite/PANI Nano-Composite Prepared by Flash Auto Combustion Method

A.M. A. Henaish[1], M. M. Ali[1]* and D.E. El Refaay [2,3]

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(2) King Khalid University, Majardah College of Science and arts, KSA

(3) Physics Department, Faculty of Science, Suez University, Egypt

ABSTRACT

$NiFe_2O_4$/PANI nano-composite with different polyaniline (PANI) contents (25 %, 50 % and 75 %) was synthesized. The $NiFe_2O_4$ (NF) was prepared by the flash auto combustion method and annealed at 400^{o}C for 2hr. The PANI was prepared by oxidative polymerization of aniline. The X-ray diffraction (XRD) technique confirmed that the $NiFe_2O_4$ particles are successfully dispersed in the PANI matrix with single phase structure. The characteristic absorption bands are observed from infrared (IR) spectra for the pure NF, pure PANI and their nano-composite. The dielectric constant (ε') behavior of NF/PANI nano-composite at higher PANI content tends to be a polymer behavior. The Curie temperature decreased by increasing the PANI content and it is attributed to the basis of A-B exchange interaction due to the variation of Fe^{3+}content among the octahedral and tetrahedral sites. The values of the saturation magnetization (Ms), remanence magnetization (Mr), coercivity (Hc), area and squareness (Mr/Ms) are measured using a vibrating sample magnetometer (VSM).

Effect of Reduced Particle Size on the Structural and Physical Properties of $Cofe_2o_4$ Nanoparticles

T.M. Ali[1], S. M. Ismail[1], S.F. Mansour[2], M.A. Abdo[2] and M. Yehia[1]

(1)Reactor Physics Department, Nuclear Research Center, Atomic Energy Authority, Egypt
(2)Physics Department, Faculty of Science, Zagazig University, Egypt

ABSTRACT

The structure and magnetic properties of $CoFe_2O_4$ were investigated. Cobalt ferrite has been synthesized by the citrate – nitrate combustion method. X-ray diffraction analysis (XRD) illustrated a single-phase cubic structure for all the prepared samples. The particle size was found to strongly depend on the heat treatment. High-resolution transmission electron microscopy (HRTEM) confirmed the formation of nanoparticles with spherical shapes. Fourier Transform Infrared Spectroscopy (FTIR) revealed the two characteristic bands of ferrites. The M–H curve provided information regarding the magnetic parameters such as saturation magnetization (Ms) and coercivity (Hc).

Effect of Silver Nanoparticles on the Properties of Cobalt Ferrites

M. Kaiser

Reactor Physics Department, Nuclear Research Center Atomic Energy Authority, Egypt

ABSTRACT

Ferrites nanomaterials (NMs) in the form of $CoAg_xFe_{2-x}O_4$ (x=0.0, 0.03, 0.07, 0.1 and 0.2) has been prepared by citrate auto-combustion method. Structure analyses were carried out using X-ray diffraction (XRD). Fourier transform infrared spectroscopy (FT-IR) confirmed the formation of spinel crystal structure. High resolution transition electron microscope (HT-TEM) revealed the formation of particles with mixed morphologies. The average particles size ranged from 22 to 31 nm. Vibrating sample magnetometer (VSM) measurements showed that the saturation magnetization M_s and coercivity H_c were affected by grain size variation. The electrical properties of the samples were investigated over a frequency range from 10^2 to 10^5 Hz. Electric modulus analysis showed that the conduction phenomena was due to short range mobility of charge carriers. The variation of dielectric loss with frequency at different temperatures showed two types of conduction mechanisms. All these parameters suggested that the synthesized materials are recommended for producing exchange spring magnets and electrode materials.

Effect of Pre-Irradiation Treatment in the Calculation of Bulk Etching Rate

M. S. El -Nagdy [a], I. G. Saqr [b], A. Mater [a], A. I. Abd El-Hafez [c], N. A. El-Faramawy[d]

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[d] Physics Department, Faculty of Science, Ain Shams University, Egypt

ABSTRACT

In the present study the bulk etching rate have been examined for CR-39 samples exposed to pre-irradiation treatment. The samples were etched by sodium hydroxide solution with concentrations of 8, 10 and 12 N. For each normality, the etching time was taken at 2, 4, 6, 8, 11 and 12 hours at temperature 70 °C and 80 °C, but at temperature 90 °C, it was taken at 1, 2, 3, 4, 5 and 6 hours. These etching processes were accomplished before exposing to ^{241}Am alpha source for 2, 10 and 40 minutes. After exposure, the etching process was changed to be 6.25 N NaOH solution and temperature 70 °C for 8 hours. Results indicated that bulk etching rate was affected by temperature, normality and time of etching where bulk etching rate V_B increases with increasing normality and temperature. V_B is nearly constant at low temperature and changes at higher temperature. Bulk etching rate is directly proportional with exposure time for samples exposed to pre-irradiation treatment.

Sunday 16/2/2020

Chairmen:

Prof. Dr. Jacqueline Daoud **Prof. Dr. Yasser El-Nadi**

Hall (B)

7) Radio Chemistry (1) 15:00 - 17:00

No.	Time	Title	Speaker
1	**15:00 - 15:20**	**Extraction and Separation Feasibility of Samarium (III) and Ytterbium (III) from Nitric Acid Solution Using a Commercial Trialkylphosphine Oxide in Kerosene** B.A.Masry, M.I. Aly, M.S. Gasser, N.A. Khalifa and J.A.Daoud	**B.A.Masry**
2	**15:20 - 15:40**	**CYANEX 925 as Potential Extractant for the Extraction and Separation of Zirconium (IV) and Niobium (V) from nitric acid solution** M.M. Zeid, M.I. Ali, J.A. Daoud A.I. Hashem and H.F. Aly	**J.A. Daoud**
3	**15:40 - 16:00**	**Separation and Recovery of Pr (III), Nd (III), Tb (III), and Dy (III) Ions from Aqueous Solution on Isomorphous Zeolites** M.I.Aly and Risto Harjula	**M.I.Aly**
4	**16:00 - 16:20**	**A Comparative Study on the Recovery of Rare Earth Elements from Phosphogypsum Fertilizers** E.M. Abu Elgoud, Z.H. Ismail, M.S. Gasser, and H.F. Aly	**E.M. Abu Elgoud**
5	**16:20 - 16:40**	**Purification of Certain Strategic Metal Ions from Phosphoric Acid by Micro Capsule Containing OPAP** Sh.Sh. Emam, M. S. Gasser, S.E. Rizk and H.F. Aly	**Sh.Sh. Emam**
6	**16:40 - 17:00**	**Studies on Some Parameters Affecting the Assessment of Radon-222 Releases from Various Industrial and Environmental Materials** M.F. Attallah and M.A. Hilal	**M.F. Attallah**

Extraction and Separation Feasibility of Samarium (III) and Ytterbium (III) from Nitric Acid Solution Using a Commercial Trialkylphosphine Oxide in Kerosene

B.A.Masry[a]*, M.I. Aly[a], M.S. Gasser[a], N.A. Khalifa[b] and J.A.Daoud[a]

[(a)] Hot Laboratories Center, Atomic Energy Authority, Egypt

[(b)] Department of chemistry, Faculty of Science, Helwan university,Egypt

ABSTRACT

The extraction of Sm(III) and Yb(III) from nitric acid solution with a commercial trialkylphosphine oxide (TRPO) extractant in kerosene was separately studied. The effects of the different parameters affecting the extraction process such as contact time, $[HNO_3]$, [TRPO], $[NO_3]^-$, $[H^+]$, $[M^+]$ and phase ratio as well as temperature were investigated. The extracted organic species for Sm(III) and Yb(III) were found to be $Sm\left(NO_3\right)_2(OH).2\,TRPO$ and $Yb\left(NO_3\right)_2(OH).2TRPO.H_2O$ respectively. The maximum loading capacity of TRPO is 9.4 $x10^{-3}$ M Sm (III) and 6.2 $x10^{-3}$ M Yb (III) per mole extractant. McCabe –Thiele diagrams showed that Sm (III) requires two stages for complete extraction while four extraction stages are sufficient for complete extraction of Yb (III) by TRPO in kerosene. A maximum stripping of 66.80% of loaded Sm(III) was obtained with 1 M H_2SO_4 and 4 M Na_2CO_3; and 52% of loaded Yb(III) was achieved with 1M HCl. The separation feasibility of samarium and ytterbium is also discussed based on the difference in their extraction and stripping behavior as well as temperature.

CYANEX 925 as Potential Extractant for the Extraction and Separation of Zirconium (IV) and Niobium (V) from Nitric Acid Solution

M.M. Zeid[a], M.I. Ali[a], J.A. Daoud[a]* A.I. Hashem[b] and H.F. Aly[a]

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[(b)]Faculty of Science, Ain Shams University

ABSTRACT

The potential use of CYANEX 925 in kerosene for the extraction and separation of Zirconium (IV) and Niobium (V) from nitric acid solution is explored. The effects of the different parameters affecting the extraction process as extractant, metal, nitric acid and nitrate concentrations as well as temperature were separately investigated. Stripping investigations on the recovery of Zr(IV) and Nb(V) from their loaded organic solutions were also carried out. The obtained results indicate that the extracted metal species are $Zr(NO_3)_4$.CYANEX 925 and $Nb(OH)_2(NO_3)_3$.CYANEX 925 for Zr(IV) and Nb(V), respectively. The difference in the extraction and stripping behavior of the investigated metals indicated that a good separation between Zr(IV) and Nb(V) could be obtained when carrying out the extraction from low nitric acid concentration at low temperature or when using 1M sulphuric acid for stripping 99% of Zr(IV) with nearly no stripping of Nb(V) from the loaded organic solution. The obtained results indicate that CYANEX 925 is a promissing extractant for high extraction and separation of Zr(IV) and Nb(V) from nitric acid solution compared with other organophosphorus extractants.

Separation and Recovery of Pr (III), Nd (III), Tb (III), and Dy (III) Ions from Aqueous Solution on Isomorphous Zeolites

M.I.Aly[b] and Risto Harjula*[a]

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[()b]Hot Laboratory Center, Atomic Energy Authority, Egypt

ABSTRACT

Adsorption of Pr (III), Nd (III), Tb (III), and Dy (III) ions from aqueous nitric acid solutions by two TSZ 360HuA- type zeolites and (HM) Hydroginmordinite were studied. It was found that Pr (III), Nd (III), Tb (III), and Dy (III) were mostly adsorbed at pH 2-3. The effect of Fe (II) on adsorption process was investigated in concentration range (0.001- 0.1) M Fe (II) and it was found that adsorption of Pr (III), Nd (III), Tb (III), and Dy (III) ions gradually decreased with the increase of Fe (II) concentration. The sorption capacity (q_e) and distribution coefficients (Kd) were determined from exchange isotherms for the sorption system as a function of metal ion concentrations. The separation feasibility of Pr (III), Nd (III), Tb (III), and Dy (III) ions was also discussed and it was found that the highest separation factor $S_{Tb/Dy} > S_{Pr/Nd}$ and was obtained with 0.05g (TSZ 360HuA- type) or (HM) from 20 ml solution at pH 2-3 and contact time of 3days. Recovery of Pr (III), Nd (III), Tb (III), and Dy (III) adsorbed on zeolites (360HUA) and Hydrogen mordinite (HM) using $(NH_4)_2SO_4$ in the concentration range (0.03M-2.5M) was also investigated.

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A Comparative Study on the Recovery of Rare Earth Elements from Phosphogypsum Fertilizers

E.M. Abu Elgoud, Z.H. Ismail, M.S. Gasser, H.F. Aly
Hot Laboratories Center, Atomic Energy Authority, Egypt

ABSTRACT

The increasing demand on rare earth elements (REEs), used in the electronic and other industries, such as batteries, magnets, computer monitors, and technologically advanced products, has incited the development of novel processes to recover REEs from secondary sources. Phosphogypsum (PG), a waste by-product from the wet manufacturing process of phosphoric acid, contains some REEs, so it can be used as a secondary source. Egyptian PG contains a small amount of P_2O_5 ranging from 1.01 to 2.53%, hence is used as a low-grade phosphogypsum fertilizer (PGF). Leaching of REEs from PGF by different leaching agents namely; mineral acids (HCl, H_2SO_4, HNO_3), weak acids (boric acid, malic acid, citric acid) was investigated in terms of the acid concentration, agitation time, and phase ratio (acid volume to mass of PGF ratio (L:S)) as well as leaching temperature. It is found that the highest leaching efficiency by mineral acids was obtained using 3.0 M HNO_3, L/S = 3.0 and mixing time of 3.0 hr, at room temperature. In the case of weak acids, the highest leaching efficiency was obtained using1.0 M citric acid, L:S ratio of 5:1 and contact time 0.25 hr at a temperature of 85.0 ^oC.

Purification of Certain Strategic Metal Ion from Phosphoric Acid by Micro Capsule Containing Opap

Sh.Sh. Emam, M. S. Gasser, S.E. Rizk and H.F. Aly
Hot Laboratories Center, Atomic Energy Authority, Egypt

ABSTRACT

OPAP–Mg–carbonate-micro capsule particles were successfully prepared by W/O/W emulsion method. Mg-carbonate micro-capsule particles containing OPAP extractant was characterized using XRD, XRF, SEM, FT-IR and thermal analysis. The characterized investigations showed that these capsules are crystalline of tube shape, smooth surface with average crystal size of 13.8 nm. Sorption of La(III), Nd(III) and U(IV) by the prepared OPAP-Mg-carbonate micro-capsule particles were investigated by batch experiment in terms of time and volume to solid mass ratio (*V/m*). The prepared micro capsule particles have a high ability to extract U(IV) from a mixture solution containing 100 mg/L U(IV), 150 mg/L La(III) and 150 mg/L Nd(III) in 5.0 M H_3PO_4. The equilibrium sorption of these particles can be satisfactorily explained by the pseudo second-order kinetic model and Langmuir isotherm data. Further, 0.5 M Na_2CO_3 is promising to desorb this metal ion effectively.

Studies on Some Parameters Affecting the Assessment of Radon-222 Releases from Various Industrial and Environmental Materials

M.F. Attallah* and M.A. Hilal

Department of Analytical Chemistry and Control, Hot Laboratories Center, Atomic Energy Authority, Egypt

ABSTRACT

Radon is a radioactive element that decays by the emission of alpha particles. ^{222}Rn is important in radiological protection because it decays through the sequence ^{218}Po, ^{214}Pb, ^{214}Bi, ^{214}Po and ^{210}Pb. Its migration occurs by diffusion. The measurement of its releases from existing residue repositories are often necessary to provide an input parameter to model radon dispersion in the atmosphere, for final assessment of radiological impact and for the investigation of any required ameliorative actions. The purpose of this study is to support environmental assessments by presenting stat-of-the-art concepts of various parameters affecting radon emanation and exhalation. Baseline radon exhalation levels for industrial and environmental materials are evaluated.

Sunday 16/2/2020

Chairmen:

Prof. Dr. Mohmed kamal Shaat **Prof. Dr. Nagib Ashoub**

Hall (C)

8) Nuclear Reactors (2) 15:00 - 17:00

No.	Time	Title	Speaker
1	**15:00 - 15:15**	**Safety and Economics of Advanced Light Water Reactors (ALWRs)** Mohamed K. Shaat	**Mohamed K. Shaat**
2	**15:15 - 15:30**	**Optimization of Alternative Fuel Composition in HTR-10 Reactors** Mohamed A. Alzamly, Moustafa Aziz, Alya A. Badawi, Hanaa Abou Gabal and Abdel Rraouf A. Gadallah.	**Mohamed A. Alzamly**
3	**15:30 - 15:45**	**El-Dabaa Sit: Contents and Conditions of Site Approval Permit** Mohamed A. Halim	**Mohamed A. Halim**
4	**15:45 - 16:00**	**Analytical Study for the Architectural Design of Nuclear Power Plants** Mohamed Abd El-Monem Zaki Farahat	**Mohamed Abd El-Monem Zaki Farahat**
5	**16:00 - 16:15**	**Studying the Impact of a Nuclear-Powered Naval Ship Severe Accident on Aquatic Biota Using RASRAD Code** E.F. Salem, W.F.Bakr, Asmaa K. Abdien and F.S.Tawfik	**E.F. Salem**
6	**16:15 - 16:30**	**Application of a Graded Approach on the Implementation of a Management System for ETRR–2 Research Reactor** Ayman A. Eisa	**Ayman A. Eisa**
7	**16:30 - 16:45**	**Assessment of Safety Culture in Maintenance and Measures for Improvement in Hypothetical Nuclear Facility** Alaa Abdelwahab Saleh	**Alaa Abdelwahab Saleh**
8	**16:45 - 17:00**	**Safety Analysis of Loss of Flow Accident in MTR Research Reactor** Nageib Ashoub, Hassan Ibrahim Saleh and Amany Arafa	**Nageib Ashoub**

Safety and Economics of Advanced Light Water Reactors (ALWRs)

Mohamed K. Shaat

Nuclear Engineering, Reactors Department, Egyptian Atomic Energy Authority (EAEA)

ABSTRACT

This study presents the state- of-the- art technologies in the design of nuclear power plants. Advanced light water reactors are the latest evolution of nuclear power plants, as AP-1000 and VVER-1200. They meet the international safety requirements for G III nuclear power plants, which were consistent with IAEA International Nuclear Safety Group (INSAG) recommendations.

Egypt in cooperation with Rosatom will build in the near future a VVER-1200 NPP.

VVER-1200 & Ap-1000 design takes account of Design Extension Conditions (DEC), in accordance with the current IAEA Safety Standards, and Fukushima lessons learned, including, long- term cooling of reactor core without electric power, long- term decay heat removal that does not rely on primary ultimate heat sink (sea, river, cooling tower) and protection of reactor containment integrity with dedicated systems after a core melt- down accident.

The safety systems are designed to have the capability for stable operation under adverse conditions due to natural phenomena. These phenomena include earthquakes, floods, storm winds, hurricanes, snowfalls, tornadoes, low and high extremes of temperatures. This is in addition to man- induced events, such as aircraft crash or impact from aircraft parts, air shock wave, fire and flooding caused by water pipe breaks, inherent safety: based on feedback processes and defense in depth: using successive barriers.

The main concept for providing fundamental safety functions is based on passive systems that deal with design extension conditions and beyond design basis accidents (BDBA), e.g., passive SG cooling system, passive containment cooling system, and provide back- up for active safety systems, multiple train redundancy: for control systems, diversity: the back – up systems for providing the basic safety functions, Physical separation: all the four trains of safety systems and their control systems are physically separated. Also, the main control room and emergency control room are physically separated and core catcher and core melt cooling in case of severe accidents.

Also, the study presents a comparison among different energy sources from conventional fuel, renewable energy and nuclear energy based on economics and environmental impacts.

Optimization of Alternative Fuel Composition in HTR-10 Reactor

Mohamed A. Alzamly[1], Moustafa Aziz[1], Alya A. Badawi[2], Hanaa Abou Gabal[2] and Abdel Rraouf A. Gadallah[1].

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[(2)]Department of Nuclear and Radiation Engineering, Faculty of Engineering, Alexandria University, Egypt

ABSTRACT

This research investigates the use of thorium based fuel (ThO2-PuO2 and ThO2-PuO2-UO2) in HTR-10 reactor to reduce the uranium fuel demand as well as the amount of plutonium in a stockpile. The effects on the different parameters such as;Criticality (active core height, number of fuel pebbles and number of moderator pebbles at which the reactor approached criticality), Neutronic parameters (Effective neutron multiplication factor, Reactivity and Shutdown Margin), Point kinetic parameters (Effective delayed neutron fraction, Prompt neutron lifetime and the prompt neutron generation time)which are of a great importance in safety evaluation of a nuclear reactor, burnup analysis (Discharge burnup, core cycle length, consumption of fissile materials (235U, 239Pu, and 241Pu), Buildup of actinides and conversion ratio) for normal core loaded by UO2 fuel pebbles of the reference HTR-10 reactor. Other two types of thorium based fuel (ThO2-PuO2 and ThO2-PuO2- UO2) were suggested, investigated and optimized by performing the calculations mentioned above for each type of fuel, hence the results were compared with those of a normal core loaded by UO_2 fuel pebbles of the reference HTR-10 reactor.

The MCNP 6.1 computer code used to build a complete model to simulate HTR-10 reactor, hence, investigate the previous objectives. The model was validated using benchmark problems. A good agreement between the criticality calculations and the experimental measurements (123.06 cm) has found, with 3.4% error, due to necessary assumptions to model double heterogeneity and random packing.The results obtained by the model were compared with previously published papers and good agreement were found.

EL-Dabaa Site: Contents and Conditions of Site Approval Permit

Mohamed A. Halim

Egyptian Nuclear and Radiological Regulatory Authority (ENRRA)

ABSTRACT

El-Dabaa NPP project needs to be licensed for all different stages which are sitting, construction, pre-operation, operation and decommissioning stages. Hence, for sitting stage ENRRA relates to El-Dabaa site through the assessment of all documents delivered by the applicant. According to law 7/2010 two main reports shall be delivered by applicant to get site approval permit.

There two reports have been already presented. The specialists in ENRRA reviewed and assessed the reports and based on the results of assessment, the specialists recommended the issuance of site approval permit on conditions, that already done.

Analytical Study for the Architectural Design of Nuclear Power Plants

Mohamed Abd El-Monem Zaki Farahat

Siting and Environment Department, Egyptian Nuclear and Radiological Regulatory Authority
Cairo, Egypt

ABSTRACT

This paper aims to study the architectural design and components of nuclear power plants (NPPs). Its main objective is to set general guidelines for architects who will design these plants. They should be aware of the basics of nuclear facilities designs and components. An onshore nuclear power plant consists of a nuclear reactor, a control building, a turbines building, cooling towers, service buildings (an office building & a medical research center) and a nuclear & radiation waste storage building. The paperalso focuses on the simulation system (simulator). It aims to study the architectural principles and standards used in designing and planning of onshore nuclear power plants**.** In drawing up a master plan of an onshore nuclear power plant, the methods used in town planning should be used. These methods are centralized, linear, radial, clustered and grid. This paper aims also to study the special features of the master plan of an onshore nuclear power plant. The buildings in an onshore nuclear power plant should be segregated according to the levels of radioactivity in each one of them. There are cold areas, warm areas and hot areas. Furthermore, this paper aims to study the recent design concepts of offshore (ocean) nuclear power plants to help the engineers from different departments who will design these plants. The development of design concepts of offshore nuclear power plants have continued due to initiatives taking place in France, United States, Russia, and South Korea. Submerged - Type Offshore NPP designed by a research group in France and Gravity Based Structure (GBS) - Type Offshore NPP designed by a research group in South Korea have been studied. In addition, Floating (Spar – Type) Offshore NPP designed by a research group in United States of America and Russia's first Floating Offshore NPP (Akademik Lomonosov) utilizing the (PWR) technology have been studied. At the end of this paper, conclusions and recommendations on the architectural aspects of nuclear power plants are revealed. This paper is important as it reveals the need to study nuclear facilities and give recommendations to the architects on how to deal with these vital facilities that have an increasing demand on the international, regional and national levels.

Studying the Impact of a Nuclear-Powered Naval Ship Severe Accident on Aquatic Biota Using RASRAD Code

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(1) Department of nuclear Law and Nuclear Licenses, Egyptian Nuclear and Radiological Regulatory Authority
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(3) Department of Sitting and Environment, Egyptian Nuclear and Radiological Regulatory Authority

ABSTRACT

Naval ships are designed to function under very difficult circumstances. The most common cases of nuclear ship incidents/accidents are collisions, problems with the nuclear power reactor, groundings, fires and explosions as well as leaks in the sea-water systems of submarines. Accidental release to air caused by criticality or core melt is considered a real radiological hazard. This study consists of two parts; the first part aims at estimating the core inventory of the suggested accident due to melting of nuclear fuel in the ship's power reactor using RASCAL code. The radionuclides concentrations which have been evaluated in the marine environment are Am-241, Pu-231, Cs-137, Sr-90, and I-131. The control of the behavior of accidental released radionuclides on surface water body was calculated using mathematical equation. In the second part, the dose rate for aquatic biota was evaluated using the RESRAD-BIOTA code. The obtained results indicate that assessment of the radiological impact of accidental releases of Sr-90 and Cs-137 to marine biota is higher than ICRP dose limit by a factor of 10^3 over the first 100m from the release point and by a factor of 10 over a distance 4.0 Km from the release point. The study also showed that the radiological impact of accidental release of I-131 to marine biota increases by factors of 10^4 and 10 at 100.0m and 4.0Km from release point; respectively.

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Application of A Graded Approach on The Implementation of A Management System for ETRR-2 Research Reactor

Ayman A. Eisa

Department of Nuclear Safety and Radiological Emergency, Division of Industrial Radiation, National Center of Radiation Researches and Technology (NCRRT), Atomic Energy Authority, Egypt

ABSTRACT

Egypt Second Research Reactor(ETRR-2) is an open pool type, with a nominal power of 22 MW and a maximum thermal neutron flux of $2.7x10^{(14)}$ n cm^{-2} s^{-1}. It is a multipurpose reactor which is used for research & development in neutron physics, materials science, radioisotope production, neutron radiography, activation analysis, silicon-doping, beam tube applications, education and training in nuclear engineering and reactor operation.

A process for establishing an integrated management system (IMS) for the operation phase of the ETRR-2 reactor was initiated. This process consists mainly in developing the existing quality assurance programme to an IMS following the requirements of the IAEA safety standards. The IMS will take into account nuclear and radiation safety requirements in addition to the other quality, health, and environmental objectives. The main objective is to enhance the operational safety of the reactor facilities and to further develop a strong safety culture. Development of the IMS takes into account use of a graded approach in application of the safety requirements for the ETRR-2, including the national regulatory requirements, conditions established by the reactor safety analysis report and operational limits and conditions, as well as the international safety requirements established by the IAEA Safety standards. The paper presents and discusses the main elements of the IMS, including the established processes, and associated documentation. Detailed discussion is also provided on application of a graded approach in establishing and implementing a process for classification of structures, systems and components for the ETRR-2 research reactor.

Assessment of Safety Culture in Maintenance and Measures for Improvement in Hypothetical Nuclear Facility

Alaa Abdelwahab Saleh

Department of Nuclear Safety and Radiological Emergency, Division of Industrial Radiation, National Center of Radiation Researches and Technology (NCRRT), Atomic Energy Authority, Egypt

ABSTRACT

The function of nuclear facility maintenance is to preserve and restore the inherent safety, reliability and availability of facility structures, systems and components for reliable and safe operation. Maintenance in nuclear installations has specific characteristics that put demands on the way maintenance activities are organized and carried out. Safety culture is the complexity of beliefs, shared values and behavior reflected in making decisions and performing work. The presence of a strong safety culture in maintenance contributes significant value to the safe operation of a nuclear facility. With respect to nuclear facility maintenance, safety culture means keeping the maintenance process on track and in control at every stage of nuclear facility performance. When there is a strong safety culture, maintenance staff excels in the preparation and execution of the tasks in compliance with the safety, quality and technical specifications. In this paper a proposed strategy is presented for development of safety culture in maintenance based on structured approach of maintenance with clear roles and responsibilities, identifying and studying problems, to make decisions on safety priority and to prepare and schedule intendance activities. Thus, the safety culture will be exemplified in all aspects of maintenance.

Safety Analysis of Loss of Flow Accident in MTR Research Reactors

Nageib Ashoub[1], Hassan Ibrahim Saleh[2]and Amany Arafa[2]

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[(2)]Radiation Engineering Department, National Center for Radiation Research and Technology, Atomic Energy Authority, Egypt

ABSTRACT

Loss of flow in research reactors is considered a serious accident effect in reactors safety. Therefore, this study provides the thermal hydraulic analysis of a partial flow blockage in a signal MTR fuel assembly. The PARET code is used in order to compute some important parameters at different cases of loss of flow blockage up to 50% of nominal flow rate beside the normal operation flow rate. The clad and fuel central temperature are investigated to estimate the integrity of the fuel plate. This work developed a MATLAB engine interface module that is responsible for executing the PARET code. Besides, that module edits the PARET input file, selects the number of blockage ratio scenarios and their input parameters, and draws the relation between different selected output parameters. It utilizes the MATLAB visualization capability to plot and graph data outputs from the PARET environment in a 3D fashion. The results of the axial distributions of the coolant, Clad Surface, Fuel Surface, and Fuel Centerline temperatures with respect to time during different scenarios of operation are demonstrated. The entire thermal hydraulic parameter results predicted that the temperatures would remain far below the fuel temperature safety limit, even though at the highest suggested blockage ratio.

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Sunday 16/2/2020

Chairmen:

Prof. Dr. Atef El-Taher **Prof. Dr. Hassan Omar Nafie**

Hall (A)

9) Nuclear Physics 17:30 – 19:30

No.	Time	Title	Speaker
1	**17:30 - 17:45**	**VMI Model in Terms of Softness Parameter** H.O.Nafie, Eman Osama and Zidan Mohamed M. Houmani	**H.O.Nafie**
2	**17:45 - 18:00**	**Optical and Double Folding Analysis for $^{6}Li+^{16}O$ Elastic Scattering** Sh. Hamada, Abd Elrahman Elgamala, N. Darwish, and I. Bondouk	**Abd Elrahman Elgamala**
3	**18:00 - 18:15**	**A Correlation Study of Plasma Focus Characteristics and Soft X-Ray Yield** T. M. Allam , H. A. El-sayed, K. M. Ahmed, and H. M. Soliman	**T. M. Allam**
4	**18:15 - 18:30**	**Multidisciplinary Applications by the Use of Ultra-Compact Neutron Source Based on Inertial Electrostatic Confinement Fusion Devise at Kyoto University** Mahmoud Bakr, Kai Masuda, K, Mukai and S. Konishi	**Mahmoud Bakr**
5	**18:30 - 18:45**	**Investigation of Neutron Spectrum Averaged (n,p) Reaction Cross Sections on Strontium: Reactor Production of ^{84}Rb** Gehan Y. Mohamed, H.E. Hassan and M. Al-abyad	**Gehan Y. Mohamed**
6	**18:45 - 19:00**	**Study of the Production of Positron Emitting Manganese from Chromium by Proton-Induced Reactions** A. Sayed, Elsayed K. Elmaghraby, M.Al-abyad and H.E.Hassan	**A. Sayed**

VMI Model in Terms of Softness Parameter

H.O.Nafie, Eman Osama and Zidan Mohamed M. Houmani*

Physics Department, Faculty of Science, University of Benha ,Egypt
** Physics Department, Faculty of Science, University of Sebha, , Sebha, Libya*

ABSTRACT

Taking the effect of variation of moment of inertia with angular momentum " concept of softness" ,and the variable moment of inertia model "VMI", A new formula is obtained ,denoted VMINS. the VMINS model is used in calculating the energies of rotational ground bands for some even even nuclei . The predicted results of the VMINS are in good agreements with VMI results and experimental data.

Optical and Double Folding Analysis for $^{6}Li+^{16}O$ Elastic Scattering

Abd Elrahman Elgamala, N. Darwish, I. Bondouk, Sh. Hamada

Faculty of Science, Tanta University, Egypt

ABSTRACT

Available experimental angular distributions for ^{6}Li elastically scattered from ^{16}O nucleus in the energy range 13.0–50.0 MeV are investigated and analyzed using optical model of the conventional phenomenological potential and also using double folding optical model of different interaction models: DDM3Y1, CDM3Y1, CDM3Y2, and CDM3Y3. All the involved models of interaction are of M3Y Paris except for DDM3Y1 which is of M3Y Reid and the main difference between lies in the different parameters of the incorporated density distribution function $F(\rho)$. The renormalization factor N_R for $^{6}Li+^{16}O$ nuclear system was extracted in the energy ranges from 13.0 to 50.0 MeV using the aforementioned interaction models.

A Correlation Study of Plasma Focus Characteristics and Soft X-Ray Yield

T. M. Allam , H. A. El-sayed, K. M. Ahmed, and H. M. Soliman

Plasma and Nuclear Fusion Department, Nuclear Research Center, Atomic Energy Authority, Egypt

ABSTRACT

In this paper, the Lee Model code (RADPF5.15 K) was used to carry out the numerical experiments to compute the soft X-ray yield, Y_{sxr} from a low energy plasma focus device, EAEA-PF1, (2.2 KJ) as a function of Argon gas pressure, outer electrode, OE radius of coaxial electrodes system, b aspect ratio = z/2a where z and a are the length and radius of inner electrode, IE respectively and PF column properties including PF column geometry such as radius, a_{min} and length, z_f of it, PF pinch current I_P, PF pinch duration time τ_{pf}, PF ion density n_i and temperature T. Correlation between PF column magnetic pressure and kinetic pressure is detected at the optimized conditions for a maximum value of Y_{sxr}. Also the effect of PF column properties on maximum value of Y_{sxr} at different values of b is studied briefly in the present work.

Multidisciplinary Applications by the Use of Ultra-Compact Neutron Source Based on Inertial Electrostatic Confinement Fusion Devise at Kyoto University

Mahmoud Bakr[1,2,*], Kai Masuda[3], K, Mukai[2], S. Konishi[2]

(1) Physics Department, Faculty of Science, Assiut University, Egypt

(2) Institute of Advanced Energy Kyoto University, Kyoto, Japan

(3) Fusion Energy Directorate, National Institutes, (QST), Japan

ABSTRACT

Neutrons were discovered for the first time by Chadwick in 1932. Since that time, neutrons have been intensively used in wide-scale applications, such as medicine, biology, material science, radiography, explosive detection, nuclear security, power generations, …etc. The type of applications depends strongly on the neutron source characteristics, such as source size, safety, handling method, and the neutron flux. the first of its kind portable and an ultra-compact neutron source based on the inertial electrostatic confinement fusion (IECF) device is being developed in this study for multidisciplinary applications in Kyoto University. In the IECF device, the neutrons are generated from the fusion combustion of deuterium–deuterium (D-D), or deuterium-tritium (D-T) fuels. The neutron production rate from the portable IECF system operated using DD fule, so far, is $1x10^8$ neutron/sec by applying only 5.5 kW power to the system. The IECF device characterizations, the principle of operation and the on-going applications in nuclear security, boron neutron capture therapy (BNCT), and radiography applications will be presented and discussed in the conference.

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Investigation of Neutron Spectrum Averaged (n,p) Reaction Cross Sections on Strontium: Reactor Production of ^{84}Rb

Gehan Y. Mohamed, H.E. Hassan and M. Al-abyad
Experimental Nuclear Physics Department, Cyclotron Facility, Nuclear Research Center, Atomic Energy Authority, Egypt

ABSTRACT

Threshold reactions induced by reactor fast neutrons are well recognized. The ^{84}Rb cross section were determined in the strontium samples by activation analysis with fast neutrons, using the threshold reaction.The fast neutron flux was determined using the threshold reactions ^{54}Fe(n,p)^{54}Mn and ^{58}Ni(n,p)^{58}Co.The measured Cross section of ^{nat}Sr(n,p) ^{84}Rb Reaction in the present work is 5.8 mb.

Study of the Production of Positron Emitting Manganese from Chromium by Proton-Induced Reactions

A. Sayed, Elsayed K. Elmaghraby, M.Al-abyad, H.E.Hassan
Experimental Nuclear Physics Department, Nuclear Research Center, Atomic Energy Authority, Egypt

ABSTRACT

The excitation functions of both natCr(p,x)52m,52g,54Mn reactions were evaluated experimentally by the stacked-foil technique on natural chromium isotopes and copper monitor foils. Stacks were irradiated by proton beam with energies up to14.7(MeV) on the MGC-20 cyclotron at Nuclear Research Center, AEA, Egypt. Isomeric state of the excitation functions of $52mMn$ was determined through the 21 min weak isomeric decay to avoid interference with the $52gMn$ and EC gamma lines. Two theoretical codes namely, EMPIRE 3.2.2 and TENDLE have been used to calculate the reactions cross section at different energies from which the excitation functions were constructed and compared with the experimental results. Integral yields were calculated and presented. + β.

Sunday 16/2/2020

Chairmen:

Prof. Dr. El-Sayed Hegazy **Prof. Dr. Mahmoud Ashour**

Hall (B)

10) Polymer Science 17:30 – 19:30

No.	Time	Title	Speaker
1	**17:30 - 17:50**	**Structural, Mechanical and Dielectric Properties of Polyvinylchloride/ Graphene Nano Platelets Composite** R. M. Ahmed, and A. A. Ibrahiem, and A.S.El-Bayoumi	**A.S.El-Bayoumi**
2	**17:50 - 18:10**	**The Use of Polypyrrole Nanocomposites Coated on Rice Husk Ash for the Removal of Anions, Heavy Metals, COD from Textile Wastewater** Neama Ahmed Sobhy and Ahmed Reyad	**Neama Ahmed Sobhy**
3	**18:10 - 18:30**	**Radiation Synthesis of Polyvinyl alcohol/Acrylic acid/ Magnesium Oxide Nanocomposite Hydrogel for the Removal of Boron from its Aqueous Solution** Ashraf M. Abdel Ghaffar , Faten I. Abou El Fadl, and Naeem M. El-Sawy	**Naeem M. El-Sawy**
4	**18:30 - 18:50**	**Radiation Synthesis of Biopolymers for the Removal of Zirconium (IV) from Aqueous the Solution** Asmaa Sayed, Yahya H.F. Al-Qudah, Soad Yahya, Hanaa Kamal and El-Sayed A. Hegazy	**Hanaa Kamal**
5	**18:50 - 19:10**	**Structural, Morphological, Optical and DC electrical properties of Silver nanoparticles-doped PVA/PANI Blend** M.M.Abdelhamied, A.M. Abdel reheem, A. Atta, A.T.M.Farag, and Weiwei Liu	**A.M. Abdel reheem**
6	**19:10 - 19:30**	**Photocatalytic Degradation of Crystal Violet by Transition Metal Ions-Loaded Date-Palm Based Activated Carbon** Ahmed M. Soliman , S. A. A. Elsuccary, Ismail M. Ali, and Ahmad I. Ayesh	**Ahmed M. Soliman**

Structural, Mechanical and Dielectric Properties of Polyvinylchloride/ Graphene Nano Platelets Composite

R. M. Ahmed[1,*] and A. A. Ibrahiem[1], A.S.El-Bayoumi[2]

(1) Physics Department, Faculty of Science, Zagazig University, Egypt

(2) Atomic Energy Authority, National Center for Radiation Research and Technology, Egypt

ABSTRACT

Graphene Nano Platelet (GNP) – polyvinylchloride (PVC) composites were fabricated for capacitors applications. Therefore investigations used to predict some parameters such as the effect of GNP on microstructure, mechanical and dielectric permittivity in a frequency range from 4Hz to 5 MHz. Micro-structural analyses showed a uniform distribution of GNP in PVC with some aggregates. XRD analysis shows that the crystal size of composite films was decreased first and then increased with increasing the amount of GNP. When the GNP content increased to 2.5 wt. %, the amounts of dislocation densities (δ) and lattice imperfection are increased, affecting there by the mechanical behavior of composite films. This apparently provides a classical dispersion strengthening and improves the tensile strength up to ~100%, while the Young's modulus were enhanced remarkably to about 108.7%. The permittivity ε' displayed an increase in its values with increasing GNP content due to the creation of considerably strengthened interfacial polarization phenomenon, which can contribute to complex electric modulus M*. The activation energy of nano-composites was decreased with increasing GNP content due to increasing the number of conductive networks in nano- composites, and hence enhancing the conductivity of the polymer composites considerably.

The use of Polypyrrole Nanocomposites Coated on Rice Husk Ash for the Removal of Anions, Heavy Metals, COD from Textile Wastewater

Neama Ahmed Sobhy and Ahmed Reyad

Sanitary & Environmental Institute, Housing & Building National Research Center, Egypt

ABSTRACT

In this study, a new application of polypyrrole (PPy) synthesized chemically in presence of ferric chloride as an oxidant coated on rice husk ash (RHA) by oxidative chemical polymerization method is used. Ferric chloride has been found to be the chemical oxidant and water has been reported to be the best solvent for chemical polymerization of pyrrole. The removal of anions, heavy metals such as copper, iron and zinc and COD (chemical oxygen demand) from textile wastewater using completely mixed batch reactor (CMBR) technique is investigated when polypyrrole and its blend and nanocomposites with rice husk ash were used. Experiments were conducted using PPy/RHA during 30 min with 5 min intervals. It is observed that by increasing the time (5–20 min), removal efficiency increased. However, after 20 min the efficiency did not increase significantly. It can be concluded that RHA in the composites does not play a significant role in the anions and COD removal but the role of RHA in the removal of the metals is considerable and it causes an increase in the removal efficiency of the composites. Besides, the morphology was tested by scanning electron microscopy (SEM) to characterize the surface of PPy nanocomposites at very high magnification at an accelerating voltage of 15 kV, and chemical structure was tested by Fourier Transform Infrared spectroscopy (FTIR) in the wavelength range of 400–4000 cm

It was found that PPy/RHA can be used as an effective adsorbent in the removal of anions, heavy metals and COD from textile wastewater.

Radiation Synthesis of Polyvinyl alcohol/Acrylic acid/ Magnesium Oxide Nanocomposite Hydrogel for the Removal of Boron from its Aqueous Solution

Ashraf M. Abdel Ghaffar *, Faten I. Abou El Fadl, Naeem M. El-Sawy

Radiation Research of Polymer chemistry Department, Industrial Irradiation Division , National Center for Radiation Research and Technology, Atomic Energy Authority, Egypt

ABSTRACT

Various compositions of polyvinyl alcohol/Acrylic acid [Poly(PVA/AAc)] hydrogels were prepared using of gamma radiation. The properties of the prepared Poly(PVA/AAc) hydrogel and Poly(PVA/AAc/MgO) nanocomposite hydrogel were characterized by various techniques such as FTIR, XRD, TEM, and SEM. The Transmission Electron Microscopy (TEM) and X- ray diffraction (XRD) patterns of MgO nanoparticles indicating that the MgO with average particle size ranged from 18.11 nm up to 45.6 nm. The Gel (%) of the prepared Poly(PVA/AAc) hydrogel with different content of acrylic acid increased with increasing both irradiation dose and Acrylic acid (AAc) content (wt %). The swelling (%) of Poly(PVA/AAc) hydrogel at different irradiation doses and different AAc contents was found to be decreased with increasing both the irradiation dose and acrylic acid (AAc) content (wt %). The effect of incorporation of MgO nanoparticles into the Poly(PVA/AAc) hydrogel matrix for absorption of boron from aqueous solution under various factors such as different concentrations of boron, different concentration of MgO and at different treatment time were investigated. It could be concluded that the modified Poly(PVA/AAc/MgO) nanocomposite hydrogel with composition (10/90/5 wt%) has a higher substitution, macroporous structure and characterized by better performance in boron uptake capacity.

Radiation Synthesis of Biopolymers for the Removal of Zirconium (IV) from Aqueous Solution

Asmaa Sayed[a], Yahya H.F. Al-Qudah[b], Soad Yahya[a], Hanaa Kamal[a] and El-Sayed A. Hegazy[a]

[a] *Polymer Chemistry Department, National Center for Radiation Research and Technology, Atomic Energy Authority, Egypt*

[b] *Chemistry Department, Faculty of Science, Al-Balqa Applied University, As-Salt 19117 Jordan*

ABSTRACT

This work explores the potential a facile, cost-effective and commercially viable method to prepare of sawdust polymeric films for zirconium Zr (IV) ions removal from aqueous medium. In this regard, cellulose acetate (CA) grafted P (glycidyl methacrylate) (PGMA) was prepared via radiation induced graft polymerization. The effect of sawdust content (wt%) on the properties of CA-g-PGMA films was studied. The surface properties, structure and composition of CA-g-PGMA/sawdust polymeric films were characterized using XRD, SEM, FTIR and ICP. The introduction of ionizable groups into the graft copolymer by NaOH-treatment regulated in improving its properties compared to untreated ones and these properties depend mainly on the number and form of the ionizable groups. Removal of zirconium (IV) removal from aqueous medium was studied in batch mode experiments. The results of this study indicate that modification of CA-g-PGMA/sawdust films shows a great potential for simultaneous removal adsorptive of zirconium ions from aqueous solution.

Structural, Morphological, Optical and DC electrical Properties of Silver Nanoparticles-doped PVA/PANI Blend

M.M.Abdelhamied[1,2], A.M. Abdel reheem[2], A. Atta[3,2], A.T.M.Farag[4], and Weiwei Liu[1]

[(1)]The School of Physics, Huazhong University of Science and Technology, Wuhan 430074, China

[(2)]Radiation Physics Department, National Center for Radiation Research and Technology (NCRRT), Atomic Energy Authority, Egypt

[(3)]Physics Department, College of Science, Jouf University, Sakaka, Saudi Arabia

[(4)]Physics Department, Faculty of Science, Al_Azhar University, Egypt

ABSTRACT

In this study, nanocomposites composed of Polyvinyl alcohol (PVA), Polyaniline (PANI) and Silver (Ag) are synthesized using solution cast technique. The optical properties and DC electrical conductivity of the PVA/PANI/Ag nanocomposites are systematically studied. X-ray diffraction and scanning electron microscope (SEM) characterization shows that the Ag nanoparticles are uniformly embedded into the PVA/PANI film without any aggregation, and the size of the nanoparticle ranged from 13 nm to 16 nm. The optical band gap of the nanocomposites is determined by ultraviolet (UV) absorbance, which shows a decrease compared with the pristine PVA film. DC conductivity is measured in the temperature range of 293–353 K, and it was found that the conductivity increases as the dopant concentration and temperature increase. In addition, the activation energy is determined from the relation between the DC conductivity versus temperature by using Arrhenius's law. The results indicate the PVA/PANI/Ag nanocomposites are of great potential for optoelectronics applications.

Photocatalytic Degradation of Crystal Violet by Transition Metal Ions-Loaded Date-Palm Based Activated Carbon

Ahmed M. Soliman [a,d *], S. A. A. Elsuccary[b], Ismail M. Ali[c], and Ahmad I. Ayesh[d]
[(a)] *Hot Laboratory Center, Atomic Energy Authority, Egypt*
[(b)] *Faculty of Science, Beni-suef University, Beni-suef, Egypt*
[(c)] *Department of Mathematics, Statistics and Physics, Qatar University, Doha, Qatar*
[(d)] *Chemistry Department, College of Science, United Arab Emirate University, Al-Ain,U.A.E.*

ABSTRACT

In this work, the properties of activated carbon that was prepared from date palm stone by H_3PO_4 activation were investigated. The surface of the prepared activated carbon was found to be acidic with pH_{pzc} of 3.95, Brunauer-Emmet-Teller (BET) surface area of 12.7m^2/gm, and it exhibits meso and microporous structures. The prepared activated carbon was loaded with Zn(II), Cd(II), Cu(II), and Pb(II) metals by adsorption and ion exchange. Scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), X-ray photoelectron spectroscopy (XPS), and Fourier transform infrared spectroscopy (FTIR) were used to elucidate the morphology, composition, and bonding of loaded metals to the functional group on carbon surface. The prepared activated carbon and its loaded metal ions were used for catalytic decomposition of crystal violet (CV) dye under solar radiation. The highest rate constant for photocatalytic degradation was obtained for activated carbon loaded with Zn(II). The Zn(II) was used for many cycles of photocatalytic degradation under solar light without loss in its decolorization of dye was completed with 80 percent mineralization. The activated carbon loaded with catalytic degradation efficiency was prepared. The effects of pH of dye solution, dye concentration and mesh size of the catalyst on catalytic decomposition were examined, where the highest degradation rate was obtained at pH 6.8. The degradation rate increased with decreasing dye concentration and mesh size of the catalyst. In addition, the effects of scavengers: methanol, ammonium oxalate, and p-benzoqunon on the photocatalytic degradation of crystal violet for activated carbon loaded with Zn(II) were investigated. It was found that the degradation of the crystal violet dye takes place via attacking by oxidizing species hydroxyl radicals $^{\cdot}OH^{-}$.

Sunday 16/2/2020

Chairmen:

Prof. Dr. Essam Zakaria **Prof. Dr. Soheir A El-reefy**

Hall (C)

11) Radio Chemistry (2) 17:30 - 19:30

No.	Time	Title	Speaker
1	**17:30 - 17:50**	**Sorption Kinetic Study of Molybdenum Ion on Magnetite Nanoparticles** R. Gamal, I. M. Ahmed, Aly A. Helal and A. A. Helal	**R. Gamal**
2	**17:50 - 18:10**	**Sorption Isotherms of Radiocaesium on Selected Soil Samples** A.S.Ibrahim, W.E. Y. Abdelmalik and S.M. Sefien	**A.S.Ibrahim**
3	**18:10 - 18:30**	**Sorption Behavior of Some Lanthanides on Graphene Oxide-Manganese Dioxide Composite** Zakaria A. Mekawy, Reda R. Sheha, Hanan H. Someda, Mohamed K. K. Shehata and Wagiha H. Mahmoud	**Reda R. Sheha**
4	**18:30 - 18:50**	**Extraction Behavior of the Separated Leaching Solution from Simulated Ceramic-Coated Fuel** Osama Farid, and Ragab Maree	**Osama Farid**
5	**18:50 - 19:10**	**Polyaniline Based Cerium Phosphosilicate: Synthesis, Characterization and Diffusion Mechanism of La(III) Ions in Aqueous Solution** I. M. Ali, M. M. El-Shorbagy, H. E. Rizk, M. A. El-Sharkawy and S. A. Sadeek	**I. M. Ali**

Sorption Kinetic Study of Molybdenum Ion on Magnetite Nanoparticles

R. Gamal, I. M. Ahmed, Aly A. Helal, A. A. Helal
Hot Laboratories and Waste Management Center (HLWMC), Atomic Energy Authority, Egypt

ABSTRACT

Magnetite nanoparticles (Fe_3O_4) were synthesized by co-precipitation method using iron salts and in presence of humic acid (Fe_3O_4/HA). The successful preparation in nanoscale was confirmed by XRD and TEM. The TEM image shows that the size of Fe_3O_4 is around 15 nm and the presence of humic acid reduces the magnetite aggregation and stabilizes the magnetite suspension. To evaluate the impact of the nano-scale on the adsorption studies, batch technique was performed with respect to various process variables such as contact time, pH as well as temperature. The kinetics and isotherms of Fe_3O_4 and Fe_3O_4/HA for Mo (VI) ions show that the sorption kinetics follow the pseudo-second- order and Langmuir isotherm model for both sorbents. The thermodynamic parameters (ΔG^o, ΔH^o and ΔS^o) were also calculated.

Sorption Isotherms of Radiocaesium on Selected Soil Samples

A.S.Ibrahim, W.E. Y. Abdelmalikand S.M. Sefien

Radiation Protection Department, Nuclear Research Center, Atomic Energy Authority, Egypt,

ABSTRACT

Using soil materials in purification of liquid radioactive waste is considered as an easy economic technique. The present study discuses the use of soil samples obtained from Ismailia cannal bottom sediments and Egyptian west desert (Wadi Elnatroun area desert, about 20 km west Alexandria- Cairo desert Road) to the sorption of Caesium radionuclide. Several investigations were carried out on the studied soil sample including; chemical analysis, physical properties as bulk density, void fraction and particle size distribution as well as mineralogical investigation by the use of X-ray diffraction technique. Those investigations showed that the studied sample is mainly smectite mineral. Sorption of the radionuclide (^{134}Cs) by this soil sample was carried out using the "batch" technique. The obtained data were interpreted using both Freundlich and Langmuir adsorption isotherms. A comparison of the constants obtained from the isotherm graphs is clearly discussed.

Sorption Behavior of Some Lanthanides on Graphene Oxide-Manganese Dioxide Composite

Zakaria A. Mekawy[a], Reda R. Sheha[a], Hanan H. Someda[a], Mohamed K. K. Shehata[a] and Wagiha H. Mahmoud[b]

[(a)]*Nuclear Chemistry Department, Hot Laboratories Center, Atomic Energy Authority, Egypt*

[(b)]*Department of Chemistry, Faculty of Science, Ain Shams University, Egypt*

ABSTRACT

Manganese dioxide decorated graphene oxide (GO-MnO_2 composite) was prepared via fixation of MnO_2 on the surface of graphene oxide (GO) and used as an adsorbent for separation of europium and cerium ions from aqueous solutions. GO, MnO_2 and GO-MnO_2 composites were characterized using scanning electron microscopy (SEM), Thermal analysis (TGA), X-ray diffraction (XRD), Raman spectroscopy and Fourier transform infrared spectrum (FT-IR). The role of different variable as: contact time, solution pH, metal ion concentration, adsorbent dosage, ionic strength and temperature on sorption efficiency was studied using batch technique. Two simplified kinetic models pseudo first-order and pseudo-second-order were applied to describe the sorption process. It was found that sorption of Eu(III) and Ce(III) ions on synthesized adsorbents could be described more favorably by pseudo-second-order kinetic model. Sorption data have been interpreted in terms of both Freundlich and Langmuir isotherms. Desorption of Eu(III) and Ce(III) ions from loaded samples was studied using different eluents. The data suggest the possible use of synthesized sorbents for separation of these lanthanides from their aqueous solutions.

Extraction Behavior of the Separated Leaching Solution from Simulated Ceramic-Coated Fuel

Osama Farid[1] and Ragab Maree[2]
Reactors Department, Nuclear Research Center, Atomic Energy Authority, Egypt
Hot Laboratories Center, Atomic Energy Authority, Cairo, Egypt

ABSTRACT

The crush-leach process was investigated as a method to treat GEN IV simulated ceramic-coated reactor fuel. Simulated ceramic-coated fuel was prepared using fine carbon as a coating and surrogate elements for fuel, the method retained the bulk of the carbon components in elemental form, which is favorable for achieving waste reduction goals. Simulated ceramic-coated fuel was crushed and nitric acid was added to the fines as a slurry that led to rapid and effective leaching of the heavy metal. The leaching process of the simulated crushed ceramic-coated fuel and extraction behavior of the separated leaching solution was tested at the laboratory scale. Results showed that carbon used in the preparation of stimulated fuel was difficult to be separated by filtered, indicating the need to carefully control particle size and/or use alternative solid-liquid separation methods. Neither foams nor emulsions were observed during the solvent extraction step, which indicated that measurement of the distribution ratios for uranium were slightly larger than predicted by previous models. This increase may be due to small concentrations of organics, but the experimental results are not conclusive. Although the results do not strongly indicate effects by a contaminating organic agent, the organic species may exist in small concentrations. Such an organic species could affect the extraction behavior of the solvent if it accumulates over time.

Polyaniline Based Cerium Phosphosilicate: Synthesis, Characterization and Diffusion Mechanism of La(III) Ions in Aqueous Solution

I. M. Ali[a], M. M. El-Shorbagy[a], H. E. Rizk[a], M. A. El-Sharkawy[a] and S. A. Sadeek[b]

[(a)] Atomic Energy Authority, Cairo, Egypt

[b]Chemistry Department, Faculty of Scince, Zagazig University, Egypt

ABSTRACT

In this work, polyaniline cerium phosphosilicate (PACePSi) has been synthesized by oxidative polymerization of aniline into the fresh white precipitate of cerium phosphosilicate (CePSi). SEM, XRD, IR and XRF have been used to characterize the structure of materials. The pH-titration curve of PACePSi has been reported to identfy a strong monofunctional acid cation exchanger composite. This new synthesized PACePSi was applied to remove toxic La^{3+} from aqueous solution. Kinetics of ion removal has been studied to determine the mechanism of process. The effects of different experimental parameters on the La^{3+}/PACePSi adsorption such as initial ion concentration, particle size, reaction temperature and drying temperature against interaction time were investigated in batch mode. The obtained data correlated well with the particle diffusion mechanism. The activation energy (E_a), activation entropy ΔS^*, and diffusion coefficient D_0 were evaluated. The correlation of these parameters with the ion-exchange characteristics of materials is discussed.

Monday

17/2/2020

Invited Talks

Hall (A)

Monday 17/2/2020

Chairmen :

Prof. Dr. M. N. H. Comsan **Prof. Dr. M. S. El -Nagdy**

12) Invited Talks 9:30 – 10:00

No.	Time	Title	Speaker
1	**9:30 – 10:00**	**Gen IV Reactors and the Use for Non-Electricity Applications**	**M. N. H. Comsan**

Monday 17/2/2020

Chairmen:

Prof. Dr. Mohamed.A.Gomaa **Prof. Dr. R.M. K. El-Shinawy**

Hall (A)

Workshop (In memory of the late professor Anas El-Naggar

13) Radiation Protection 10:00 – 12:30

No.	Time	Title	Speaker
1	**10:00 – 10:20**	**International, National Transport of Radioactive Material Regulations and Experiences Gained Over 50 Years in Egypt** R.M. K. El-Shinawy	**R.M. K. El-Shinawy**
2	**10:20 – 10:40**	**Design of a New Approach for Nuclear Materials Transportation Packages to Counter Lone Wolf Threats** G. F. Sultan , Hassan F. Morsi, and M. I. Youssef	**G. F. Sultan**
3	**10:40 – 11:00**	**Radiation Safety Controls for Radiation Sources and Lessons Learned** A. Z. Hussein	**A. Z. Hussein**
4	**11:00 – 11:20**	**New Techniques in Medical Application of Radiation in Diagnosis and Therapy** Aya Abaza	**Aya Abaza**
5	**11:20 – 11:40**	**On the Implementation of Radiation Protection Measures to Individuals Searching for Gold at Remote Area** M. A. M. Gomaa	**M. A. M. Gomaa**
6	**11:40 – 12:30**	**Round Table Discussion**	**M.A. Gomaa**

International and National Transport of Radioactive Material Regulations and Experience Gained Over 50 Years in Egypt

R.M.K. El-Shinawy
Radiation Protection Department Nuclear Research Center,
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Egypt

ABSTRACT

International transport regulations issued by the IAEA since 1961 provide standards for insuring a high level of safety of people, transport workers, property and environment against radiation, contamination and criticality hazards as well as thermal effects. The history and scope of these international and national regulations were mentioned. Protection is achieved by a combination of limitation of package content according to the type and activity of the content, the package design and training in the field.

Several reviews, conducted in consultation with member states (MS) and international organizations concerned, resulted in several comprehensive revisions being published, the last one was in June, 2018 [SSR-6(R_1)].

National regulations for the safe transport of radioactive materials (which were laid down and published by Suez Canal Authority (SCA) in their navigation rules are known all over the world and updated according to the IAEA and other relative organizations) are used to regulate and control the transportation of radioactive materials through SCA and regulations mentioned in law (7/2010) all over the country (Cairo airport, Alex. and Port Said harbors) to different users.

Design of a New Approach for Nuclear Materials Transportation Packages to Counter Lone Wolf Threats

G. F. Sultan[1,*], Hassan F. Morsi[1], and M. I. Youssef[2]
(1) Egyptian Nuclear and Radiological Regulatory Authority, Cairo, Egypt
(2) Faculty of Engineering, Al Azhar University, Cairo, Egypt

ABSTRACT

This paper proposes a new design approach for nuclear materials transportation packages. The proposed approach will remotely enable the responsible bodies to counter the lone wolf terrorists. The design uses the intelligent transportations systems and human behavior recognition to counter the lone wolf threats. The proposed system can achieve its functions by itself. In this design approach, the electroencephalogram techniques are used to continuously authenticate the drivers to secure the vehicles, and the protected area physical barriers are supported by a wireless network that covers the desired protected area where the entrance to that area requires permission from the security and if there is no entering permission the system will prevent the vehicle to enter into that area. In drivers-threaten behavior including intentional vehicles ramming and changing of previously approved transport routes, the system will prevent the driver from controlling the vehicle, stop the vehicle as soon as possible, and inform the security force to ensure a fast response. The mathematical analysis and case study results show that, the proposed system could effectively counter the lone wolf attacks by vehicles. By applying this design approach on vehicles and transportation of packages, a lot of accidents can be avoided, particularly those caused by lone wolves such as intentional run-over accidents or robbery of nuclear materials.

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Radiation Safety Controls for Radiation Sources and Lessons Learned

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ABSTRACT

Radiation safety controls are intended to ensure high standards of radiation protection for the use of ionizing radiation in medicine, industry, and nuclear facilities as well as preventing or mitigating potential radiation hazards. A framework for radiation protection, as proposed and reviewed by the international intergovernmental organizations, is essentially the concept for countries` radiation protection regulations and practices.

In practical study of industrial radiography relevant to accidents, it is found that 26 events are reported during 2012- 2016 for over exposure personnel and it is concluded as a result due to human errors events.

Radiation Protection Programs could lead to more efficient use of radioactive sources for different applications as well as other benefits against its hazards. It is well known that a number of challenges for protection should to be met. One, for example, is satisfactory addressing and demonstrating adequate protection for those aspects of waste disposals, which continue to be the subject of public controversy. Practical ways to apply the concept of potential exposure to a variety of practice required continuing development efforts. An important challenge is involving the interested social parties in protection decisions and adequate social dimensions (Socio-economic conditions).

New Techniques in Medical Application of Radiation in Diagnosis and Therapy

Dr. Aya Abaza

Radiation Protection Department, Egyptian Nuclear and Radiological Regulatory Authority (ENRRA) Egypt

ABSTRACT

Radiologists are often asked to perform a panel of imaging examinations as part of the initial diagnosing, staging or follow-up of patients. The discovery of x-rays more than a century ago profoundly changed the practice of medicine by enabling physicians and scientists to see inside of the living body. Today, modern medicine is undergoing another major transformation, and nuclear medicine and molecular imaging are on its leading edge, probing deep inside the body to reveal its inner workings. Unlike conventional imaging studies that produce primarily structural pictures, nuclear medicine and molecular imaging visualize how the body is functioning and what is happening at the cellular and molecular level.

The evolution in diagnostic imaging, from producing anatomical pictures to imaging and measuring the body's physiological processes, is critically important to all facets of medicine today, from diagnosing a disease at its earliest stage and developing more effective therapies to personalizing medical treatment. Digital image acquisition has become the standard for modern equipment used in angiography, ultrasonography, computed tomography, magnetic resonance imaging, and radionuclide radiology, but most radiological images are still recorded, interpreted, and stored on x ray films.

The aim of this study is to discuss the advances in diagnostic imaging that have resulted from recent technical innovations and other aspects of radiology in which technical advances have had an impact on clinical practice. This review comprises a personal selection of recent reports from mainstream radiology journals and the results of Medline searches which highlighted the advances in diagnostic imaging and therapeutic impaction that have resulted from recent technical innovations. This review illustrates some of the ways in which diagnostic imaging has exploited advances in technology and computation to provide greater insight into physiological structure and function for medical applications.

On the Implementation of Radiation Protection Measures to Individuals Searching for Gold at Remote Area

M. A. M. Gomaa
Atomic Energy Authority, Cairo, Egypt

ABSTRACT

Searching for gold at remote areas is attracting people all over the world. Recently people from Egypt and Sudan are searching for gold at the borders of both countries.

Recent studies by researchers at research institutes and universities measured radioactivity from NORM samples collected at fixed sites.

The published results indicated that the estimated annual dose is greater than the annual dose limit for for occupational exposure.

For the implementation of radiation protection measures to individuals searching for gold, the latest 2007 ICRP recommendations for planning exposure situation should be implemented.

Monday 17/2/2020

Chairmen:

Prof. Dr. David Sears **Prof. Dr. Abdelwahab Elsayed**

Hall (B)

14) Nuclear Safety 10:00 – 12:00

No.	Time	Title	Speaker
1	**10:00 – 10:15**	**Safety of Research Reactors in Africa** David Sears	**David Sears**
2	**10:15 – 10:30**	**Effectiveness of Cadmium Capsules for Reactor Shutdown During Failure of Emergency Shutdown Systems; a Case Study of GHARR-1** Henry Kwame Obeng	**Henry Kwame Obeng**
3	**10:30 – 10:45**	**NNRA Regulatory Oversight of Nigeria Research Reactor** Godpower Gbeneneh	**Godpower Gbeneneh**
4	**10:45 – 11:00**	**Radiation Protection and Enforcement of Safety During Nigerian Research Reactor-1 Core Conversion** R.B. Umar, Y.A. Ahmed, T. Muhammad, J.A. Yusuf and A.R. Abubakar	**R.B. Umar**
5	**11:00 – 11:15**	**Safety Analysis of SBO and SBLOCA scenarios of Krsko nuclear power plant for PCTRAN software calculations compared to MAAP4 and RELAP5/SCDAPSIM Calculations** HADJAM Ahmed, SAAD Djillali	**HADJAM Ahmed**
6	**11:15 – 11:30**	**Radioisotope Application Challenges in Zambia** Reuben Katebe	**Reuben Katebe**
7	**11:30 – 11:45**	**ZAMBIA'S NUCLEAR PROGRAMME** Fredrick CHEWE	**Fredrick CHEWE**
8	**11:45 – 12:00**	**AMSSNuR Regulatory Oversight for TRIGA MARK II Research Reactor** K. Mrabit, T. Marfak, and Y. Esserhir El Fassi	**Y. Esserhir El Fassi**

Effectiveness of Cadmium Capsules for Reactor Shutdown During Failure of Emergency Shutdown Systems; a Case Study of GHARR-1

Henry Kwame Obeng

Senior Technologist, National Nuclear Research Institute, Ghana Atomic Energy Commission

ABSTRACT

The Ghana Research Reactor-1 (GHARR-1) is enhanced with inherent safety features as well as an effective emergency shutdown system. However in the worst case scenario where all these fail, cadmium capsules are pumped into the irradiation sites to shut down the reactor. These cadmium capsules are worth -4 mk. Considering a scenario where the emergency shutdown fails during irradiation of samples, the total reactivity worth of the cadmium capsules may differ due to their position. This study seeks to estimate the total worth of the cadmium capsules in the inner irradiation sites in such a scenario. The work is being carried out theoretically using the Monte Carlo N-Particle (MCNP) code.

NNRA Regulatory Oversight of Nigeria Research Reactor

Godpower Gbeneneh

Nigerian Nuclear Regulatory Authority (NNRA)

ABSTRACT

The Nigerian Research Reactor 1 (NIRR-1) is a miniature neutron source reactor designed by China National Nuclear Cooperation (CCNC) used mainly for scientific research, neutron activation analysis and training. The reactor core was using 90% enrichment uranium fuel from 2004 when it became critical until 2018 when the core was converted to use 13% enriched uranium fuel. The reactor went through the core conversion process in December 2018 making it the last research reactor in Africa to have its core converted. The conversion process was part of the international efforts, coordinated by the IAEA, to minimize the civilian use and reduce associated security and proliferation risk. Regardless of the international efforts, the conversion process was subject to rigorous regulatory control to ensure compliance with established requirements. This paper presents the regulatory control program for the conversion process as established and implemented by the Nigerian Nuclear Regulatory Authority (NNRA).

The NNRA was established by the Nuclear Safety and Radiation Protection Act 19, 1995 in 2001 and is responsible for regulating all activities and facilities involving the use of ionizing radiation and nuclear materials. The NNRA is responsible for development of regulations and guidance documents, authorizations, inspections, enforcements and reviews and assessment of facilities and activities. Consequently, the NNRA had the legal mandate to provide regulatory oversight of the conversion program. This paper presents the NNRA relevant regulations and guides on the conversion process, the authorizations required for the process and NNRA inspections activities carried out during the process. Furthermore, the paper presents the review and assessment process implemented by the NNRA and the documents submitted by the operators of the research reactor. Finally, the paper presents the lessons learnt and challenges encountered during the conversion process. It concludes with recommendations addressing the challenges encountered.

Radiation Protection and Enforcement of Safety During Nigerian Research Reactor-1 Core Conversion

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Center for Energy Research and Training, Ahmadu Bello University, P.M.B. 1014, Zaria, Nigeria

ABSTRACT

The Nigeria Research Reactor-1 (NIRR-1) commissioned at the Center for Energy Research and Training Ahmadu Bello University, Zaria, was first critical February 3, 2004. It is a Miniature Neutron Source Reactor (MNSR) licensed to operate for three days a week. Prior to its conversion HEU core to LEU core, NIRR-1 was operated with HEU core for a period of fourteen years with a thermal rated power of 31kw. The core conversion was carried out between October 2018 to December 2018. This paper discusses the radiation protection and safety measures employed during the reactor core conversion (HEU to LEU). Reactor core removal exercise poses significant challenge of radiation exposure to personnel and possible environmental contamination. The recent core conversion of the Nigerian Research Reactor-1 takes into account the high risk involved, and thus formulate approach to mitigate the risk. Safety and security functions were managed and controlled by teams of expert and include measures such as zone classification and continuous personnel monitoring. Metrological data were employed for the deployment of specific work zone while TLD badges were given to all personnel. Different groups involved in the conversion exercise such as Core Assembly Group, Core Removal Group, Leak Test Group, were prohibited from crossing over to work zones outside of their assignment. The rigorous enforcement of safety and security ensures that the radiation dose of all personnel involved in the conversion exercise is lower than the 5mSv, administrative limit of the Center and thus less than the 20mSv limit of the IAEA.

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Safety Analysis of SBO and SBLOCA Scenarios of Krsko Nuclear Power Plant for PCTRAN Software Calculations Compared to MAAP4 and RELAP5/SCDAPSIM Calculations

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ABSTRACT

In this paper, the Station Blackout (SBO) and Small Break Loss of Coolant Accident (SBLOCA) severe accident in a Krsko nuclear power plant using PCTRAN IAEA Generic Personal Computer Transient analyzer Software were studied. This study is divided in two sets of scenarios: The first scenario is the station black-out (SBO) which is initiated by the complete loss of AC electrical power from both off-site and on-site sources. Many safety systems for reactor core residual heat removal and containment heat removal rely on AC power. The turbine driven auxiliary feed water pump is assumed to be unavailable as well. For the presented case, the scenario with the highest seal leakage rate of the Reactor Coolant Pump was chosen of 0.1 cm2 for the first 780 seconds and it increased afterwards to 2.5 cm2. The second scenario is the SBLOCA accident characterized by the breaking of the pipe connecting the reactor cooling pump (RCP) to the reactor vessel. In this analysis, the reference LOCA sequence is assumed to initiate with a pipe break of 5.08 cm and 20.32 cm equivalent diameter break in the Reactor Cooling System (RCS) cold-leg. This accident is characterized by the fast depressurization of the RCS, the free discharge of the reactor coolant inventory, and in the long term, it leads to an increase of the cladding temperature and a core melt progression occurring at a low pressure.

This paper provides a better estimate assessment of the SBO and SBLOCA scenarios in the Krsko nuclear power plant which is characterized by two-loop pressurized water reactor PWR of 2000 MWt, Westinghouse type, located in Slovenia. Given the initial plant status and boundary conditions that drive the transient SBO and SBLOCA, PCTRAN has closely reproduced the different parameters in comparison with MAAP4 and RELAP5/SCDAPSIM Calculations.

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Radioisotope Application Challenges in Zambia

Reuben Katebe
National Institute for Scientific and Industrial Research, Zambia

ABSTRACT

Zambia started applying nuclear science and technology for development in 1969 Since joining the International Atomic Energy Agency (IAEA). The activities were limited to research, educational, industrial, agricultural and medical applications.

Radio-isotopes applications in Zambia have been constrained due to lack of isotope production facilities including research reactors or cyclotrons. All isotopes used in Zambia are imported at a huge cost and limited to isotopes with long half lives. Short lived isotopes are imported with special delivery and custom clearance arrangements. Currently, most of the isotopes are imported from the Republic of South Africa and the main challenge for Zambia is that when the South African reactor is on shut down mode for maintenance, all isotope applications are halted.

The increasing demand for isotopes applications in Zambia particularly in nuclear medicine for both diagnosis and treatment of non-communicable diseases especially cancer which accounts for 23% of the deaths in the country led the government to currently negotiate with Rosatom Overseas of the Russian Federation to construct a Center for Nuclear Science and Technology (CNST) to house a 10 MW (Th) research reactor and a 30 MV cyclotron for production of long and short lived isotopes respectively.

According to the records from the Radiation Protection Authority of Zambia, in 2017, a total of 532 sealed sources were imported in the country for various applications. The following isotopes were imported; Cs-137, Ra-226, U-238, Co-60, Sr-90, Co-57, Pu-238, Ir-192, Na-22, Am-241, Am-241Be, Cd-109, Mn-54, Hg-203, Fe -55, Zn-65, Rb-88, Ba-133, I-131, Tc-99m.

Once the CNST is constructed and operated, it is expected that isotopes applications in Zambia will increase in all sectors mentioned above and this will be translated into cost saving on the importations of isotopes and improved health care for the people.

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ZAMBIA'S NUCLEAR PROGRAMME

Fredrick Chewe

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ABSTRACT

In the 2015/16 rain season, Zambia experienced a prolonged drought that consequently led to a significant reduction in hydroelectric power generation which accounts for 85 % of installed electricity generation (~2380 MW). This resulted in a reduced economic growth rate of approximately 60% according to IndexMundi. In order to address the above challenge, His Excellency the President, Dr. Edger Chagwa Lungu announced on 18th September 2015 and 16th September 2016 that his administration during its term in office would pursue nuclear energy as part of the diversified sustainable energy mix to power Zambia's economy. The 2018/19 rain season looked to be a repeat of the 2015/16 one. Government spent **K364,458,258.69 ($39,286,245.70)** on emergency power imports in 2015. (average exchange rate for 2015/16, $1≈K9.5193). This caused adverse effects on the Fiscal performance in 2015 as climate change effect was not anticipated when drawing the 2015 budget. In 2016, the figure for emergency power imports went up to **K1,130,862,610.08 (≈$ 118,796,824.35).**

In view of the above, the government decided to accelerate the nuclear programme which is divided into the following major projects:

I *Construction of the Centre for Nuclear Science and Technology (CNST)*

A. The CNST will house a Multipurpose Irradiation Centre, Research Reactor, Cyclotron, Medical Centre, Laboratories, Research and Training Centre, Lecture auditoriums, Museum, Civil infrastructure, Sports facilities, Campus and residences

II *Construction of a Nuclear Power Plant.*

III *Human resources development*

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AMSSNuR Regulatory Oversight for TRIGA MARK II Research Reactor

K. Mrabit, T. Marfak, Y. Esserhir El Fassi

Moroccan Agency for Nuclear and Radiological Safety and Security (AMSSNuR)

ABSTRACT

According to the international obligations and orientations and based on the law 142-12 related to the nuclear and radiological safety and security and associated regulations, AMSSNuR established a system of inspection covering all installations and activities using sources of ionizing radiation in Morocco.

Concerning the TRIGA MARK II research reactor, operated by the National Nuclear Energy, Science and Technology CNESTEN, a specific inspection programme has been established in collaboration with IAEA, USNRC and EU with the objective to ensure that operation activities of this installation and its associated facilities are performed safely and securely.

To cover all safety areas, AMSSNuR has developed eighteen inspection guides which were reviewed with IAEA support and were also used during the three inspections conducted in 2018 and 2019.

The inspections covered five areas: Operational limits and conditions, Radiation protection, Radioactive waste management, Maintenance and periodic testing and internal Emergency plan.

In parallel to this, AMSSNuR has developed three operational guides addressed to the CNESTEN related to the annual report of research reactor operation safety, declaration of significant events and management of modifications and experiences for the research reactor.

Aiming to complete all the areas, this programme previews to conduct three other inspections in 2020 dealing with safety committee, training and qualifications, modifications and experience. The other areas are programmed in 2021.

In this regard, the paper presents the main achievements and progress made in terms of regulatory functions related to nuclear safety, integrated management system, capacity building, human resources especially the implementation of SARCoN tool and national & international cooperation.

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Monday 17/2/2020

Chairmen:

Prof. Dr. Amanda Pourciau **Prof. Dr. Mekki Soufiane**

Hall (C)

Workshop

15) Waste Management 10:00 – 12:00

No.	Time	Title	Speaker
1	**10:00 - 10:40**	**Nuclear Waste In USA**	**Amanda Pourciau**
2	**10:40 - 11:20**	**Nuclear Waste in France**	**Mekki Soufiane**
3	**11:20 - 12:00**	**Nuclear Waste in Egypt**	**Yasser Tawfik**

Monday 17/2/2020

Chairmen:

Prof. Dr. Samir Abd-Elaziz
Prof. Dr. Wafaa Salem

Prof. Dr. Azza A. M. Shahin
Prof. Dr. Hassan Saleh

Hall (A)

16) Posters 15:00 - 17:00 pm:

No	Title	Speaker
1	**Construction and Execution Qualities of a Novel Coated Wire Potentiometric Sensor for Selective Determination of Mn(II) Ions in Various Authentic Samples** Refaat F. Aglan, H. H. Mahmoud and A. M. Rashad	**H. H. Mahmoud**
2	**Sr and Rb Mass Interferences Under Plasma Conditions** A. M. Rashad, S. A. Abd Elaal and A. M. Abdelhady	**A. M. Rashad**
3	**DNA Damage Detection After Chronic Exposure and Radio-adaptive Response of Natural Occurring Radioactive Materials (NORM).** Seham M El-Marakby , Mahmoud H Abdelgawad , Misra M Awad , Khairy M Eraba and Omar S Desouky	**Seham M El-Marakby**
4	**Cultural and Environmental Factors Related to the Public Acceptance of the Use of New and Renewable Energy in Egypt** Engy Raies	**Engy Raies**
5	**A Study of ^{226}Ra Concentration Ratios for Leafy Vegetables** A.El-Sharkawy, H. Elbegawy and H.A.Abd El Ghaffar	**H.A.Abd El Ghaffar**
6	**Synthesis of nano $PbZr_xTi_{1-x}O_3$ Using Tartrate Precursor Method for Gamma Ray Attenuation** O.M. Hemeda, T.Sharshar, H.M. ellabany, M.E.A. Eid	**M.E.A. Eid**

7	**Anisotropic Thermal, Physical and Neutron Attenuation Studies of Borated Acrylamide Composites** Wageeh Ramadan, Khaled Sakr, Magda Sayed, Nabila Maziad and Nabil El-Faramawy	**Nabila Maziad**
8	**Engineering Proposal for Risk Management in Case of Nuclear Emergency Using Meteorological Data and GIS Analysis** N. M. Sirag and F.S. Tawfik	**F.S. Tawfik**
9	**Software Updating Effects on Safety and Security of Research Reactors** Hany Sallam	**Hany Sallam**
10	**The Role of the Regulatory Body in Promoting the Cyber Security Culture** Ehab Shafei, and Hany Sallam	**Ehab Shafei**
11	**The Impact of Egypt's Current Challenges in Adopting a Conservative Approach in its Nuclear Regulations Regarding Population Considerations** Samia Morsy	**Samia Morsy**
12	**New Trends in the Internal Design for Radiation Protection in Radiological Medical Facilities** Nadia Mahmoud Sirag	**Nadia Mahmoud Sirag**
13	**Role of Radiation Safety Inspection in Industry: Case of X-Ray Applications** Howayda G. Taha	**Howayda G. Taha**
14	**Qualification of Corroborated Real Phytoremediated Radioactive Wastes Under Leaching and Other Weathering Parameters** Hosam M. Saleh, Refaat F. Aglan and Hazem H. Mahmoud	**Hosam M. Saleh**
15	**Integrated Drinking Water Quality Indices to Characterize the Groundwater of Quaternary Aquifer in the Environs of Ismailia Canal, Eastern Nile Delta, Egypt** Zenhom El-Said Salem, Mohamed Sobhy Fathy, Abdel-Fattah Ibrahim Helal, Sofia Yahia Afifi and Abdullah Muhammad Attiah	**Abdullah Muhammad Attiah**

16	**Water Security in the Arab Region** **Wafaa M. Salem**	**Wafaa M. Salem**
17	**Radioactive Dispersion in Groundwater resulting from a Postulated Accident at a Proposed Nuclear Power Plant, Northwestern a Coast of Egypt** A.I.M. Aly, R.A. Hussien and N. Nassar	**N. Nassar**
18	**Structural and Optical Studies of Iron Sulfide Nanorods Prepared as Photocatalysts Using Microwave Hydrothermal Assisted Method** Saad Ahmed	**Saad Ahmed**
19	**Radioiodination and Purification of Cefaclor for Medical Purposes** H. Hussien, Sh.A. Kandil, and S. I. Khater	**S. I. Khater**
20	**Effect of Nanoclay on EPDM Composites under Gamma Irradiation** Samaa Wasfi	**Samaa. A. Wasfy**
21	**Structural, Elastic, Electrical, and Magnetic Properties of Metals Substituted Cobalt Ferrites [$Co_{(1-x)}M_xFe_2O_4$; M=Zn, Cu, and Mn; x=0.0, 0.25, 0.5, 0.75] Nanoparticles** M.I.A. Abdel Maksoud, A.H. Ashour, E. K. Abdel-Khalek, Sh. Labib, E. Abdeltwab, M.M. El-Okr	**M.I.A. Abdel Maksoud**
22	**Radiation Synthesis of Gas Sensor Based on 2D-Polyaniline Nanoflake-Poly Vinyl alcohol) Film for Four Hazardous Gases (NH_3, CO_2, H_2S and phenol)** Mohamed Mohamady Ghobashy, Tarek Mansour Mohamed and Ehab Khozemey	**Mohamed Mohamady Ghobashy**
23	**Determination of Soil-Plant Transfer Factor of Edible Plants Grown in a Contaminated Soil with Europium – 152** Mohammed Elywa, Fawzia Mubarak and H.A. Omar	**H.A. Omar**
24	**Mechanism of Extraction of Divalent Nickel by CYANEX 921 in Kerosene Using a Lewis Cell** N. E. El-Hefny, S. I. El-Dessouky, J. A. Daoud And H.F. Aly	**N. E. El-Hefny**

25	**Column Dynamic Studies for Lanthanum(III) and Neodymium(III) Sorption From Concentrated Phosphoric Acid by Strongly Acidic Cation Exchange Resin (SQS-6)** E.M. Abu Elgoud, Z.H. Ismail, Y.A. El–Nadi, S.M. Abdelwahab and H.F. Aly	**Y.A. El–Nadi**
26	**The Simulation of Biological Effects Due to the Weak Induced Magnetic Fields** S. S. Saad	**S. S. SAAD**
27	**The Induced Magnetic Field Power Unit to Study the Bioelectric Magnetic Effects on the Vital Cells** Kh. M. Omar, I. I. Bondouk and M.W. Nabeah	**Kh. M. OMAR**
28	**Practical Up-Scaling for Safe Treatment of Low Level Radioactive Was** Fatma A. Shehata, Emad H. Boraiand and Mohamed S. Khattab	**Fatma A. Shehata**
29	**Assessment of Human Health Risk and Heavy Metal Contamination in Vicinity Around Phosphate Fertilizer Factory Using Thermal and Epithermal Neutron Activation Analysis** Mohamed S. Badawi, Ahmed M. El-Khatib, Mohamed Fayez-Hassan, Mohamed S. Hamada, Yuri N. Kopatch, Mohamed Abd-Elzaher, Wael M. Badawy, Elsayed K. Elmaghraby, Ivan N. Ruskov and Seham Ali Said	**Mohamed S. Hamada**
30	**Experience Gained on the Decontamination of Personnel** W.E.Y. Abdelmalik	**W.E.Y. Abdelmalik**
31	**Gamma Spectroscopic and Remote Sensing Analysis for Basement Rocks from Central Eastern Desert of Egypt** Atef El-Taher	**Atef El-Taher**

Construction and Execution Qualities of a Novel Coated Wire Potentiometric Sensor for Selective Determination of Mn(II) Ions in Various Authentic Samples

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ABSTRACT

a novel solid state coated wire ion selective electrode based on synthesized Schiff base N-salicylidene-o-aminophenol as ionophore for selective determination of manganese ions is described. This sensor has a wide linear range of concentration (1.0×10−7–1.0×10−1 mol L−1) and a low detection limit of 1×10−7 mol L−1 of Mn(II) ions. It has a Nernstian response with slope of 30.17±0.1mVdecade−1 and it is applicable in the pH range of 2.0–8.0 without any divergence in potential. The coated electrode has a short response time of 5 s and is stable at least for 70 days. The membrane with a composition of ionophore: NaTPB: PVC: o-NPOE (w/w, mg) in the ratio of 7: 3: 30: 60 exhibited best performance. The selectivity coefficients determined by using match potential method (MPM) and separate solution method (SSM) indicated high selectivity for Mn(II). The proposed sensor was successfully applied for the determination of Mn(II) ions in different real samples.

Sr and Rb Mass Interferences under Plasma Conditions

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ABSTRACT

The present study provides several calculations related to the interpretation and development of experiments in a dynamic reaction cell inductively-coupled plasma-mass spectrometry (DRC-ICP-MS) analysis of Sr and Rb containing samples with different matrices. The exothermal reactions found in this study were conducted between CH_3F, SF_6, CH_3Cl and N_2O with Sr, which are recommended for chemical separation between ^{87}Rb and ^{87}Sr. All other reactions were found to be endothermic and the probability their of occurrence was very low.

DNA Damage Detection after Chronic Exposure and Radio-adaptive Response of Naturally Occurring Radioactive Materials (NORM)

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ABSTRACT

The aim of the present study is to examine the effect and radio-adaptive response of chronic exposure to technologically enhanced naturally occurring radioactive materials (TE-NORM) on DNA molecule. Six groups of adult male rats were divided according to the period of TE-NORM exposure radiation (control, exposed to TE-NORM for one month, TE-NORM for two months, TE-NORM for one month before 2Gy single dose of gamma radiation, TE-NORM for two months before 2Gy gamma rays and the last group exposed to 2 Gy of gamma radiation only). Comet assay was performed in addition to some of antioxidant enzymes concentrations (superoxide dismutase (SOD), catalyze enzyme (CAT), reduced and oxidized glutathione (GSH and GSSG)). TE-NORM exposure groups (for 1 and 2 months) showed DNA damage as a high elevation in comet assay, tail length, DNA in tail and tail moment. TE-NORM exposure for one month before 2 Gy exposure showed a reduction in the harmful effects of high dose exposure only (when compared to 2Gy group). The obtained results demonstrated that although chronic radiation exposure has a deleterious effect on a DNA molecule, it showed a radio-adaptive response as noticed in TE-NORM for one month before exposure to 2Gy, while exposure to TE-NORM for two months before 2Gy produced a highly significant harmful effect. Radio-adaptive response occurs only for a short period of chronic exposure before irradiation with a single high dose; however chronic exposure for an extended period might produce irreversible effects on the DNA molecule.

Cultural and Environmental Factors Related to the Public Acceptance of the Use of New and Renewable Energy in Egypt

Engy Raies

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This research aims at identifying the cultural and environmental factors associated with the public acceptance of the use of new and renewable energy in Egypt and identifying the concept of new energy and renewable energy. This is in addition to defining the role of cultural factors such as (customs, traditions, popular beliefs) and the role of environmental factors such as income level, education, place of residence. The study also focuses on determining the impact of economic factors (income, commodity prices) on the trend towards the use of new and renewable energy.

A Study of ^{226}Ra Concentration Ratios for Leafy Vegetables

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ABSTRACT

The aim of this work is to study the factors that influence the ^{226}Ra uptake by two types of leafy vegetables collected from different farms in Al Sharqiya region in Saudi Arabia with their corresponding soils and irrigation groundwaters. Quality assurance and validation of the radioanalyses for the different samples matrices were carried out. It was a reasonable approach to determine the ^{226}Ra concentration ratios on the basis of both the exchangeable and total ^{226}Ra content in the soils. It was found that the ^{226}Ra specific activity in soils is independent on its corresponding activities in irrigation water, but correlates well with the soil texture. No significant dependency of the ^{226}Ra concentration ratios for the studied vegetables on the radium total activities in soils. Good negative correlations were found between the organic matter content of soils and the concentration ratios of ^{226}Ra in cabbage and lettuce. Some variations of the ^{226}Ra uptake were found through the two leafy vegetables which may be explained by other factors related to the metabolic characteristics of the plant species. The ^{226}Ra concentration ratios based on the exchangeable radium leached from soil for cabbage and lettuce were found to be higher than those determined on the basis of its total activity in soil. The exchangeable ^{226}Ra may contribute for a better understanding of its uptake by leafy vegetables in these farms.

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Synthesis of nano $PbZr_xTi_{1-x}O_3$ Using Tartrate Precursor Method for Gamma Ray Attenuation

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ABSTRACT

Nano size powder lead zirconate titanate PZT were fabricated by tartrate precursor at different titanium (Ti) content where, x= (0, 0.25, 0.52, 0.75). All samples were annealed at 800 ^oC. The x-ray diffraction patterns (XRD) for all samples indicates the presence of the tetragonal perovskite structure with main peak (101) at nearly 2Θ=31 ^{o}. The infrared spectra (FTIR) shows the presence of two absorption bands at around 620 cm^{-1} for Ti-O bond due to stretching vibration mode and the other band at nearly 390 cm^{-1} which is due to bending vibrations of Ti-O bond. The appearance of these bonds confirms the formation of perovskite structure obtained by XRD. The results of gamma ray attenuation measurement using ^{137}Cs and HPGE detector indicates that the sample with x=0.52 has the highest value of mass absorption coefficient which makes it a good candidate for shielding applications. The measurements of piezoelectric coefficient d_{33} shows that the sample with x=0.52 has the highest value of d_{33}. These results show that the sample with x=0.52 has many novel characteristics for industrial applications.

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Anisotropic Thermal, Physical and Neutron Attenuation Studies of Borated Acrylamide Composites

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ABSTRACT

The present work was carried-out to study the shielding properties of hydrogel using Pu-α-Be neutron source. Hydrogel block COPOLYMERS based on acrylamide (AAm) and boric acid have been prepared by radiation copolymerization of acrylamide (AAm) and boric acid in gamma cell. The influence of dose, acrylamide concentration and relative contents of boric acid on linear thermal expansion, glass transition and physical properties such as density, water absorption and porosity were examined to evaluate the composite capabilities for radiation shielding. The fast neutrons and gamma rays were measured by stilbene organic scintillator. The experimental attenuation parameters; macroscopic effective removal cross-section Σ_R (cm^{-1}) of fast neutrons and total attenuation coefficient μ (cm^{-1}) of gamma rays have been evaluated. All these enhancement of the thermal and physical properties were reflected all on the nuclear shielding parameters. The obtained results revealed that the maximum removal cross section and shielding performance were evaluated by adding 4 gm wt% of boric acid to acrylamide.

Engineering Proposal for Risk Management in Case of Nuclear Emergency Using Meteorological Data and Gis Analysis

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ABSTRACT

This paper describes a visual tool for data analysis applied to a case to solve the problem of evacuation from areas at risk and to decide on the development of the Emergency Preparedness and Mitigation Plan. Urgent protective actions are those which must be taken within hours of an emergency situation to be effective, such as fast evacuation to safe areas, Reverse direction the danger, and administration of Stable Iodine.

The task in this research are description Engineering Proposal on how take Decision placed within few hours after the nuclear accidents to decide on the development of the Emergency Preparedness and Mitigation Plan using instant measurements of climate monitoring, dispersion of pollutants and used of GIS. An emergency planning area can be defined by development of additional measures that take into account, to apply a set of maps prepared as layers representing spatial data, measurements of climate monitoring, dispersion of pollutants, to the evacuation are take place in the opposite direction of pollutant plume.

This study was proposed two place El-negela and Ras-Garb. And we have reached for activation to network analyst, it is activated directly in the emergency room for a quick evacuation.

Software Updating Effect on Safety and Security of Research Reactors

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ABSTRACT

Despite the wide application of digital systems in research reactors which have many advantages compared to analogue systems, there are some issues that should be addressed in more details whether in newly installed or old and upgraded research reactors,. One of these issues is the software updating where there are many reasons that justify the necessity to update some subsystems or the whole systems. Software may be updated to improve system functionality which may represent safety function, security function, or fix bugs. However, gained experience from software updating highlighted the fact that sometimes software updating processes jeopardize the safety and induce much vulnerability of the security of a nuclear facility for cyber security attacks. This paper discusses and analyzes the effect of software updating on safety and security of research reactors from different point of views. Also, this paper proposes a planning framework for software updating to avoid such drawbacks on safety and security.

The Role of the Regulatory Body in Promoting the Cyber Security Culture

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ABSTRACT

Nuclear power plants (NPPs) nowadays use a digital Instrumentation and Control systems (I&C) to monitor, operate, control and protect their plants. Instrumentation and Control systems (I&C) are considered to be the brain of the NPPs, and recently with the growing trend of using digital I&C systems, digital I&C systems are computer-based systems. Computer-based I&C systems are extensively used in NPPs for various safety applications, such as reactor protection systems, and in safety related applications, such as some functions of the process control systems and the monitoring systems.

However, the use of the digital I&C system can introduce the cyber security problem that may compromise important functions such as reactor shutdown or the mitigation of release of radioactive materials. Therefore, protection from cyber-attacks has been one of key issues in nuclear facilities.

The unauthorized modification of these systems (in software or hardware) or disruption of its functions can significantly affect the plant operation. It may affect the plant safety in case of safety functions are affected or normal operation in case of safety related or other control functions are affected.

As the threat landscape changes and as new actors –from criminal organizations to nation states –get involved, the threat to nuclear facilities from cyberattacks is increasingly perceived as a growing, real problem. Recent complex attacks have been designed to target to instrumentation and control (I&C) systems with all the potential consequences for safety and security such attacks may carry. Cyber security has become an essential element of the overall security framework of nuclear facilities and it is establishing itself as a priority for facility operators and national regulators.

In this paper a set of principles and attributes that constitute a framework for a cyber security culture within a nuclear regulatory body are proposed to promote the cyber security culture.

The Impact of Egypt's Current Challenges in Adopting a Conservative Approach in its Nuclear Regulations Regarding Population Considerations

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ABSTRACT

Fortunately so far no nuclear accidents happened in developed countries. What if they occur in developing countries?

Most developing countries go nuclear *not* because they own the nuclear technology, but because they simply need more energy in cheaper rates. Since safer energy sources are the most expensive while nuclear energy is less expensive, the choice of nuclear energy is because of its cost regardless of its involved risks. Moreover, since the parties involved in the process are all governmental, therefore regulatory bodies of developing countries should adopt more conservative approaches than developed countries to protect the population from the harm of ionizing radiation.

This can be achieved by requiring, in the regulations of the developing countries, the increase in the radius of the exclusion area, the increase in the radius of the low population zone, less densities of inhabitants in the low population zone, the increase in the length of population center distance from the plant, the reduction in the number of inhabitants in a population center compared to developed countries in the same time frame in cases of emergencies. A number of inhabitants in a population center can be defined according to what the developing country's government could be able to handle in a certain amount of time.

The paper outlines chronic problems the Egyptian population is suffering from in normal country state operation. It also examines the three major nuclear accidents and looks at the roles their governments played in protecting the population by defining the urgent actions such as sheltering, evacuation, distribution of iodine tablets and relocation. It argues that because developing countries are less able to deal with emergency crises as developed countries, a conservatory factor should increase distances away from the plant in nuclear regulations and reduce population numbers near the plant designated for developing countries. It is a simple way of protecting the population in developing countries where promptness for human rights of the citizens is not very much observed because of socio economic reasons.

New Trends in the Internal Design for Radiation Protection in Radiological Medical Facilities

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ABSTRACT

The incidence of cancer throughout the world is increasing with the prolonged life expectancy that has resulted from improvements in standards of living. About half of all cancer patients receive radiotherapy, either as part of their primary treatment or in connection with recurrences or palliation. For this reason, the Safety Report 2015, was initiated as a result of increase in the construction of radiotherapy facilities, and in response to Member States that have requested practical guidance regarding the design and shielding of such facilities.

The aim of this study is to elaborate the requirements for the interior design and shielding of radiological facilities prescribed in the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation, Safety Series No. 115. This report gives guidance on the design of diagnostic and radiotherapy facilities and describes how the required location of shielding should be determined, as well as shielding for brachytherapy units. The Design used is necessary for location shielding, for all types of radiotherapy facilities.

Therefore, this paper investigates achieving the global trends in interior design for radiological facilities, and to what extent this could be applied in the local situation.

Role of Radiation Safety Inspection in Industry: Case of X-Ray Applications

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ABSTRACT

The use of either x-rays or gamma rays installations is one of the most widely utilized non-destructive methods in industry to evaluate the structural integrity or find out the hidden details of an assembled structure. Since these installations use ionizing radiation, it is important to ensure the safety of the technician and the general public, as well as the protection of the environment. During testing periods, they could be exposed to a high dose of radiation in just a few seconds. Therefore, a high degree of care and professionalism is required for radiography work. Proper training of radiation workers, strict adherence to radiation safety rules, selection and maintenance of radiation sources should be taken into consideration to ensure radiation safety. The Management of Radiation Protection and Safety, Requirements for Industrial X-ray Equipment have been investigated to keep the risks ALARA while maximizing benefits.

Qualification of Corroborated Real Phytoremediated Radioactive Wastes Under Leaching and Other Weathering Parameters

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ABSTRACT

This work presents a comprehensive study for treatment and solidification of hazardous wastes; as major outcome. Portland cement was not only revealed as feasible and inexpensive material for immobilization of hazardous and radioactive waste, but, in addition, the efficiency of aquatic plants for treatment of contaminated waste water was demonstrated.

It is very important to stabilize real hazardous waste such as a secondary waste generated by the purification of water or other effluents contaminated with toxic metals or radionuclides by promising novel treatment technologies such as phytoremediation or biomass adsorption. Phytoremediation as clean technology has gained interest and wide applications in the last decade. This green technology is environmentally-friendly compared to conventional remediation techniques. Portland cement was utilized in this study to immobilize the selected biological waste, namely; dried plants of *Ludwigia stolonifera.* Three parameters were followed to estimate the mechanical, physical and chemical stability of the solidified waste. These parameters were studied under several variables and supported by mechanical, chemical, spectroscopic and scanning investigations. The results confirmed that, at both conditions, exposure to 90 freezing/thawing cycles and 6 months immersion in water of different composition, non-significant reduction in the mechanical integrity of the solidified waste samples was detected compared to the control sample. Moreover, chemical stability was investigated by monitoring the release of Cs ^{137} to the surrounding aqueous media; the cumulative mass fraction of leached Cs ^{137} was less than 0.06 under diverse conditions.

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Integrated Drinking Water Quality Indices to Characterize the Groundwater of Quaternary Aquifer in the Environs of Ismailia Canal, Eastern Nile Delta, Egypt

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ABSTRACT

Water is the very core of the sustainable development and is the key factor for future development. In a serious attempt to achieving the 6th goal "Clean Water and Sanitation" of the Sustainable Development Goals set by the United Nations General Assembly in 2015 for the year 2030, it is important to initially identify the current status of the available water resources and their suitability for safe drinking use. Groundwater of the Quaternary Aquifer in the Eastern Nile Delta region is an important source for drinking water. Seventy-six groundwater samples were collected from the Quaternary aquifer, Eastern Nile Delta region, and twenty-nine physio-chemical parameters: EC, TDS, pH, TH, K, Na, Ca, Mg, Cl, SO_4, HCO_3, CO_3, NO_3, Al, Sb, As, Ba, Cd, Cr, Cu, Fe, Pb, Mn, Ni, Se, Ag, Tl, V and Zn were determined for each groundwater sample. Based on the standard limits of the Egyptian Standards (ES) for drinking water, water-quality evaluation indices: water quality index (WQI), heavy metal pollution index (HPI) and pollution index (PI), were calculated for the groundwater samples to assess the groundwater suitability for safe drinking use. Obtained WQI results revealed that approximarely 16% of the groundwater samples are of a good quality for drinking, while about 84% of the groundwater samples are of a poor to unfit quality for drinking uses. The HPI results confirmed that the majority of the groundwater samples are contaminated by metals, where about 88% of the samples have values of HPI more than the critical value, which is 100. Results PI indicated that Fe, Mn and Sb seriuosly affect the groundwater quality for safe drinking use, while Ba, Cr and Cu have no effect, in addition Al, As, Cd, Pb, Se, Ag, Tl, V and Zn have varied effects on the groundwater quality for drinking. Water-quality evaluation indices: WQI, HPI and PI, were valuable and applicable tools to accommodate the groundwater quality for drinking based on the integrated effects of many groundwater variables, and could be used as screening tools for environmental assessments of water resources.

Water Security in the Arab Region

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ABSTRACT

Water Scarcity is a very important issue for all nations and peoples and is always discussed at the highest levels of dialogue in governmental and global organizations. The provision of water has become an essential axis for most contemporary societies due to the steady increase in the population and the scarcity of water, year after year. This is in addition to the climate change conditions such as drought, desertification, increased environmental pollution which constitutes a real threat to the entities of many countries. These will lead, in the future, to drastic differences that may arouse conflicts.

Water resources have become one of the greatest challenges for future development plans worldwide in general and in Egypt particularly. Although the volume of water in the globe is estimated at about a billion and a half cubic kilometers, most of them (approximately 97%) are salty water found in oceans and seas and some lakes, only 3% is fresh water distributed in a way that does not match the requirements.

This study aims to use the technology of environmental stable isotopes (Oxygen-18 and Deuterium) & radioisotope (Tritium) to determine the sources of recharge to the groundwater wells. In addition, applying modern mathematical models to determine the ages of these sources. This leads to develop a complete and integrated system to maintain these sources from depletion or pollution as well as developing optimal strategies for the water system in arid and semi – arid countries.

Radioactive Dispersion in Groundwater Resulting from Postulated Accident at a Proposed Nuclear Power Plant, Northwestern a Coast of Egypt

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ABSTRACT

Egypt announced it would revive its civilian nuclear power program as a part of the government's strategy to secure and diversify country's energy supply. The radiation risks to workers, public and to the environment that may arise from these applications have to be assessed and controlled. Radioactivity concentration of groundwater is predicted for 50 years after a postulated accident at a proposed Nuclear Power Reactor at El-Negila, Northwestern Coast of Egypt. The accident is assumed to be resulting from a loss of coolant accident condition of 1000 MWe Nuclear Power Reactor of the pressurized water type. The radioactive releases were estimated, and a conservative estimate of the dispersion in air and consequent containment transport of radioactive pollutants through groundwater around the reactor were modeled. The analysis results from RASCAL code are the input data to MODFLOW-MT3D model two scenarios for groundwater dispersion is assumed. The 1st scenario assumes, no pumping is used, while the second scenario assumes stressing of the system through pumping wells. Meteorological data illustrate that at the accident day, the wind direction was mainly NW direction with heavy rain precipitation of 0.02 m/d. Groundwater modeling show that the radioactive concentration of ^{137}Cs and ^{90}Sr were higher at the point source location of the released source term compared to WHO limits of drinking water borne radionuclides and decreased in all directions during 50 years of simulation indicating radionuclides retention in the aquifer matrix taking into consideration that ^{90}Sr was more absorbed than ^{137}Cs. Applying pumping stress on the system (2nd scenario) revealed that still low concentrations appear in a pumping well at the coast for both ^{137}Cs and ^{90}Sr.This is due to the fact that several factors affect the dispersion in groundwater (half life time, dispersion, adsorption-desorption).

Keywords: Nuclear Power Reactors, Rascal, Contaminant transport Modeling, MODFLOW-MT3D, Northwestern coast, Egypt

Structural and Optical studies of Iron Sulfide Nanorods Prepared as Photocatalysts Using Microwave Hydrothermal Assisted Method

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ABSTRACT

Nano iron sulfide powders were prepared by employing microwave assisted hydrothermal technology, where, 1 mole of sodium diethydithiocarbamate, as a complexing agent, was added to 1 mole of ferric nitrate solution under different pH conditions. The prepared powders were characterized using X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR), transmission electron microscopy (TEM), Raman spectroscopy, ultraviolet-visible absorbance spectroscopy (UV-vis) to study the effect of shape variation of the prepared powders on the investigated properties. According to XRD results, the powders are consisted of Fe_3S_4, FeS, FeS_2. At low pH the powder had multishapes of the different phases: cubic, oval, hexagonal shapes that varied to nanorod with different aspect ratios at higher pH. Shape controlled powders were successfully prepared by varying pH values. It was found that the powders became more crystalline, more homogeneous in shape in the alkaline medium. It was found that there was a red shift in the gap energy with increasing the uniformity of nanorods at a higher pH value. These variations were correlated to the direct effect of pH variation on the distribution of Fe^{2+}/Fe^{3+} in the B-site of Fe_3S_4 crystal structure. A non-variation of the energy gap values of FeS/FeS_2 was observed, where it was reported that a new theory based on the great effect of microwave irradiation in making an anisotropic direction of Fermi levels of these phases to be conjugated with that of Fe_3S_4.

Radioiodination and Purification of Cefaclor for Medical Purposes

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ABSTRACT

A method for radioiodination of cefaclor (cefa) with iodine-125 via electrophilic substitution reaction is developed. To optimize the conditions for the labeling of cefaclor, different reaction parameters were studied. It was found that using 3.7 MBq of Na 125I, 100 μg of cefaclor as substrate, 100 μg of CAT as oxidizing agent using acetone as a solvent at 60 ºC for 20 min. afforded a radiochemical yield of up to 90% as [125I]- cefaclor. Quality control of the product was performed by means of high pressure liquid chromatography (HPLC). A biodistribution study in normal mice illustrates the possibility of using this tracer as an imaging agent for muscles.

Effect of Nanoclay on EPDM Composites under Gamma Irradiation

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ABSTRACT

The polymers used for the insulation and jacket materials for electric cables are susceptible to degradation mechanisms caused by exposure to many of the stressors encountered in nuclear power plant service environments. EPDM is the most common type of polymer used in cables insulations used in NPP. In order to improve the EPDM insulation rubber performance, many additives can be added to the EPDM compounds. Nanoclay is selected to improve the resistance of EPDM rubber against gamma irradiation up to 600KGy. The effect of different concentration of nanoclay on the mechanical and physical properties of the EPDM rubber is investigated. The physical and mechanical properties of the EPDM rubber compounds were evaluated by measuring swelling ratio, crosslinking density, tensile strength, elongation at break and hardness. The results of the present study show that the addition of nanoclay as an additive improves the physical and mechanical performance.

Structural, Elastic, Electrical, and Magnetic Properties of Metals Substituted Cobalt Ferrites [$Co_{(1-x)}M_xFe_2O_4$; M=Zn, Cu, and Mn; x=0.0, 0.25, 0.5, 0.75] Nanoparticles

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ABSTRACT

In this paper, non-magnetic and magnetic ions substituted cobalt spinel ferrite CFO ($Co_{(1-x)}M_xFe_2O_4$; M=Zn, Cu, and Mn; x= 0.00, 0.50) were synthesized via sol-gel method. Due to the difference of the magnetic moment of the substituted ions, the properties of CFO strongly influenced, the Rietveld analysis and FTIR spectroscopy proved the successful synthesizing of the cubic spinel phase. The mean crystallite size and the strain were evaluated by applying the Williamson-Hall method. The specific surface area of CFONPs (49.50 $m^2.g^{-1}$) is increased to106.63 $m^2.g^{-1}$ on replacing Co^{2+} ions by Zn^{2+} ions. The Debye temperature determined from the elastic parameters and from infrared data is in a good conformity with each other. The hysteresis loops reveal that the magnetic properties of CFO NPs are extremely influenced by replacing cobalt ions with Zn^{2+}, Cu^{2+}, and Mn^{2+} ions. The high surface area and the promising values of the magnetization parameters of the present samples make them candidate materials as a *screen printed electrodes* and for photo catalysis applications.

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Radiation Synthesis of Gas Sensor Based on 2D-Polyaniline Nanoflake-Poly Vinyl Alcohol) Film for Four Hazardous Gases (NH_3, CO_2, H_2S and Phenol)

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ABSTRACT

An electrically-conductive material consists of 2D-polyaniline nanoflake dispersed in a polyvinyl alcohol film using ammonium per sulfate as oxidizing agents was synthesized by the interfacial polymerization. Interfacial polymerization was performed in acidic medium at pH 2 at low temperatures (–5 ° C) followed by radiation polymerization at different irradiation doses (0, 2, 4, 6, 8 and 12 kGy). Four hazard gases (NH_3, H_2S, CO_2, and phenol) were detected using the (PAni-PVA) film as gas sensor. The gas-sensing property of (PAni-PVA) film was examined at ambient conditions of temperature and pressure. The results show variation in sensing property of (PAni-PVA) film corresponding to the gas types in order NH_3 > H_2S>CO_2 > phenol. The (PAni-PVA) film was characterized by electron microscopy scanning, infrared spectroscopy, UV – Vis spectroscopy and XRD after and before four gas adsorption. PAni obtained in form of 2D-polyaniline nanoflake was confirmed. In addition, the incorporation of gas molecules with the PVA-PAni film and their change in conductivity were examined. It was found that the conductivity changed depending on the change in PAni's chemical structure.

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Determination of Soil-Plant Transfer Factor of Edible Plants Grown in a Contaminated Soil with Europium – 152

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ABSTRACT

Aims of this study are determination of activity concentration, Estimation of transfer factors for radionuclides from soil to plant and analyze correlations between soil characteristics and radionuclides concentration. Edible plants cultivated in a soil manually contaminated with specific concentrations of Europium -152 (Eu-152). HPGe detector was used to measure the activity concentration of Eu-152 and naturally occurring radionuclides of four different Egyptian plants; Phaseolus vulgaris (white beans and red beans), Cucumis Sativus (Cucumber) and Cucurbita pepo (Zucchini). The transfer factors for all plants due to absorption of Eu-152 were calculated. Results show that transfer factors values were found to be, the highest value was registered for white bean (0.0267) followed by Red bean (0.018).

The lowest activities are those measured for cucumber (0.009) and Zucchini soil (0.008). Comparisons were carried out for these results with that due to absorption of naturally occurring radionuclides by the same plants. The results of transfer factors for both Eu-152 and NORM were in good agreement. Thus, it can be concluded that, white bean has the highest activity, where, Zucchini plant has minimal activity concentration. This indicates that Zucchini plant is weak absorber of Europium -152 radioisotope and thus it is edible plant in any contaminated areas with Eu-152.

Column Dynamic Studies for lanthanum (III) and Neodymium (III) Sorption from Concentrated Phosphoric Acid by Strongly Acidic Cation Exchange Resin (SQS-6)

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ABSTRACT

Sorption of lanthanum and neodymium ions by column technique from aqueous phosphoric acid solutions using strongly acidic cation exchange resin was experimentally studied at 298 K. The breakthrough curves were measured as a function of column bed depth, initial metal concentration in the feed solution and flow rate. It was shown that the breakthrough and time increased with the increase in bed depth. At a higher initial metal concentration, the column was quickly saturated resulting in shorter breakthrough and exhaustion time. The capacity of La(III) and Nd(III) was found to be 33.55 and 17.30 mg/g, respectively. The experimental data resulting from column technique were found to follow Thomas and Yoon–Nelson models.

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The Simulation of Biological Effects Due to the Weak Induced Magnetic Fields

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ABSTRACT

The new types of communications have very strong damage for millions of people surrounding them. The SAR (Specific Absorption Rate) is a parameter that describes the amount of radiation absorbed in a specific material (chemical material & biomaterial) at a certain frequency. SAR is used for comparative study of bioelectric effects due to induced electromagnetic radiation. The SAR value was calculated using FDTD (Finite Difference Time Domain) method. The quantity can be derived from either the temperature gain or from an electric field. The method used for calculations derives the radiated effect from the electric field since the difference in temperature is too small to be measured in the cellular phone frequency band due to the low energies involved at these low frequencies (i.e non – ionizing radiation). SAR has become the most important quantity involved used when health issues are discussed. The SAR is an electromagnetic simulation platform derived using FDTD method for calculation. The SAR parameters are efficiently used due to their occurrence in the different forms and frequencies of induced magnetic radiation.

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The Induced Magnetic Field Power Unit to Study the Bioelectric Magnetic Effects on the Vital Cells

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ABSTRACT

The exposure to electromagnetic fields (EMF) has become an active and powerful area of material science, biophysics, medical, health researches and environment. The evaluation of the induced EMF effects on the vital cell, e.g. Mice, and to explains the molecular mechanism of the EMF effects on development under the flux intensity of alternating EMF fields need a device. In the bio radiological experiments with the EMF radiation, the exposure conditions must be designed in a manner such that all environmental factors are well controlled. The EMF exposure system has been designed, evaluated and prepared to create uniform and homogenous plane waves. For the wide range studies, the EMF has different intensity (magnetic force) time exposure, nearly isothermal, different forms, different wavelengths and frequencies. The EMF irradiation system with its wide region, and with energy of radiation and with suitable area. In addition, the system is calibrated in order to obtain a uniform and homogenous EMF. The induced electromagnetic radiation doses have been calculated due to the intensity and the energy of plane waves. The electric power supply is used to obtain all conditions with parameters. The parameters act on the exposure system are 1- current intensity path through the coil, 2- number of turns around the cylinder, 3- current forms, frequencies and time exposer. Body weight and food susceptibility of some life cells (mice and small chickens) have been recorded with increasing the exposure time and compared with the control group. It was found that there are some changes in food susceptibility, and body weight.

Practical Up-Scaling for Safe Treatment of Low Level Radioactive Waste

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ABSTRACT

The aim of this work is to use inorganic ion exchange medias facility at Hot Laboratories Center to remove the radioactive target nuclides from low salt contaminated water of quantity about 600 m^3 stored at the two drain tanks of ETRR-1.The applied treatment process includes coagulation, filtration, chemical precipitation followed by two subsequent ion exchange steps (cationic and anionic exchanger) to achieve a very high decontamination factor (DF) for target radionuclides such as Cs-137, Sr-90, Co-60.

There are several methods used for the treatment of radioactive liquid waste, among them ion exchange method, reverse osmosis (R.O) membrane and evaporation methods. A comparative study between Liquid Radioactive Waste Treatment Facility (LRWTF) and Reverse Osmosis Unit (ROS) is illustrated.

The final outputs of the liquid waste treatment are decontaminated water and a sludge containing the radioactive waste concentrates. The quality of the decontaminated water is acceptable for release based on clearance levels derived from the Egyptian regulatory authority and ICRP regulations. The collected sludge containing the radioactive waste concentrates are mixed with cement and poured into concrete shells to be transformed into solid matrix that can meet the waste acceptance criteria for near surface disposal.

Assessment of Human Health Risk and Heavy Metal Contamination in Vicinity Around Phosphate Fertilizer Factory Using Thermal and Epithermal Neutron Activation Analysis

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ABSTRACT

An Assessment of the environmental impact of the phosphate fertilizers and chemical industries factory close to Abu-Zabal city was considered through soil analysis. Instrumental epithermal neutron activation analysis at the reactor IBR-2 (JINR-FLNP) was used to analyze qualitatively and quantitatively the major and trace elements in soil samples, which were collected from the surrounding area of the fertilizers factory. 13 soil samples were investigated and a total of 36 elements were determined (Na, Mg, Al, Si, Cl, K, Ca, Sc, Ti, V, Cr, Mn, Fe, Ni, Co, Zn, Se, As, Br, Rb, Sr, Sb, Cs, Ba, La, Ce, Nd, Sm, Eu, Gd, Tb, Tm, Yb, Hf, Ta and W). A comparison with the available literature data was carried out. The metal pollution index (MPI), the enrichment factor (EF) and geoaccumulation index (Igeo) have been calculated. The comparison with the available literature data revealed that most of the maximum and mean values of the content of toxic heavy metals in soil samples are higher than the recommended values of the IAEA trace elements in soil and those of the other studies inside and outside Egypt. The metal pollution index is high compared with the other studies except the study of Burullus Lake .The enrichment factor is varied from moderate to significant, the geoaccumulation index also varied for moderately to strongly contaminated soil.

Experience Gained on the Decontamination of Personnel

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Radioactive contamination is considered as a source of radiation exposure. The radioactive contamination may arise from the spread of the contaminated dusts, vapors, gases and liquids. The mishandling of radioactive materials in any place of work can be a source of contamination of the working area and accordingly to the working personnel. This situation leads to the need of decontamination of the personnel and working areas. From the experience of personnel decontamination; it is carried out in several goals which can be summarized in this this work. The responding of the decontamination goals have to know at first the physical and chemical forms of the radioactive material causing the contamination. The contamination on the personnel has to be localized in contaminated body using the suitable measuring instruments. Many goals are to be considered in the decontamination processes for the whole body skin and the different parts of the body such as ears, eyes, hairs…..etc. A report has to be recorded for the contamination and decontamination procedures as a whole. From the results lessons can be gained.

Gamma Spectroscopic and Remote Sensing Analysis for Basement Rocks from Central Eastern Desert of Egypt

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ABSTRACT

The present work aims at assessing natural radioactivity levels of ^{226}Ra, ^{232}Th , ^{40}K and radiation hazard parameters in basement rocks: Monzogranite, Dokhan Volcanics (Rhyolite, Dacite, Quartz andesite, Andesitic basalt), Syenogranite, Granodiorite, Gabbro and Metabasalt samples collected from Wadi um Huytat area in Central Eastern Desert of Egypt, using high purity germanium (HPGe) detector based γ-spectrometry. The average value of activity concentrations obtained for ^{226}Ra, ^{232}Th and ^{40}K were 130.68 ± 22.11, 157.94±29.73 and 2248.31±322.13 Bq/kg, respectively. Radium equivalent activity (Ra_{eq}), Absorbed dose rate (ADR), Annual effective equivalent dose (AEED), External and Internal Hazard Indices (H_{ex}, H_{in}), the gamma index (I_{γ}), Annual gonadal dose equivalent (AGDE), Excess lifetime cancer risk (ELCR), associated with the natural radionuclides, were studied. Remotely sensed data (Landsat 8 OLI) also is used in order to reveal the high reflectance appearance of Neoproterozoic rocks which contain high concentration of radioactive elements. The averages of radiological hazard parameters are higher than the recommended values reported by UNSCEAR. The main aim of this work is to shed more light on the spatial distributions of natural radionuclides in Neoproterozoic rocks samples of Wadi Um Huytat area from Central Eastern Desert of Egypt.

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