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EPC' 21

Scientific Sessions

Friday, 26 Mar. 2021
13:30 - 18:00 Aswan
18:30 - 20:00 Session OS / Oral-1

Saturday, 27 Mar. 2021
14:00 - 15:30 Session Oral-2
18:00 - 19:30 Session Oral-3
18:00 - 19:30 Session Poster

Sunday, 28 Mar. 2021
14:00 - 15:30 Session Oral-4

Monday, 29 Mar. 2021
07:30 - 8:00 Session CS

EPC' 21

Conference Abstracts Arranged by Receiving Date

1-

CURRENT ACTIVITIES OF UNSCEAR AND IRPA IN THE FIELD OF SOURCES AND EFFECTS OF IONIZING RADIATION

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International organizations such as ICRP, ICRU, IOMP, IRPS and ICNIR play important role in the developing of recommendations in the field of protection against ionizing and non-ionizing radiation, together with United Nation Organizations such as UNSCEAR, IAEA, WHO and ILO.
Each organization play important role in its specialization. In the present work attention is paid only to two organizations namely UNSCAR and IRPA. UNSCEAR is a forum of scientific scientists interested globally in the field of sources and effects of Atomic Radiation. IRPA as a forum of Radiation Protection associate societies is a good means for cooperation between Radiation Projection experts and RP young professionals.
In the present study attention is paid to through some light of the activities of UNSCEAR and IRPA carried out during 2020.

Among new activities of UNSCEAR is the approval of three documents to be published. These documents deal with medical exposure, Fukshima accident and Biological effects of radiations. While IRPA new activities include guidelines such as: Guiding Principles on Reasonableness in Optimization of Radiation Protection, and Practical Guidance for Engagement with the Public on Radiation and Risk, as well as establishing Radiation Protection young generation network and supporting holding of international and regional radiation protection conferences.

2-

NEUTRON MULTIPLICITY IN THE PROTON-FISSION OF SOME ACTINIDES

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Energy and mass number dependence of the mean prompt fission neutron multiplicity; is studied for U-235, U-238, Np-237, Pu-239, Pu-240 and Pu-242 from 5 - 10 MeV incident proton energy using GEF nuclear reaction code, Version 2018/1.1. The nuclei considered have N/Z ratio in the range 1.570.02. For all the above nuclei, neutron multiplicity is found to fall in the range 3.5 0.7 over the energy interval. Mean neutron multiplicity versus incident proton energy shows a linear behavior for all the nuclei.

3-

APPLICATIONS OF SMALL AND MODULAR REACTORS (SMRS) FOR SUSTAINABLE DEVELOPMENT

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Small and modular reactors (SMRs) are defined as nuclear reactors producing 300 MW electric power equivalent or less, designed with modular technology using module factory fabrication, pursuing economies of series production and short construction times.
SMRs are new generation reactors designed with components and systems which can be shop fabricated and then transported as modules to the sites for installation as demand arises. Most of the designs adopt advanced or even inherent safety features and are deployable either as a single or multi-module plant. SMRs are under development for all principal reactor types; water cooled reactors, high temperature gas cooled reactors, liquid-metal, sodium and gas-cooled reactors with fast neutron spectrum and molten salt reactors. The key driving forces of the development are fulfilling the need for flexible and safe power generation without negative impact to the environment. The development based on a wider range of uses and applications, replacing ageing fossil-fired units, enhancing safety performance and offering better economic resources. The smaller size also makes these reactors ideal for small electric grids and for locations that cannot support large reactors**.**
Currently there are more than 50 SMR designs under development for different application. Three industrial demonstration SMRs are in advanced stage of construction: in Argentina (CAREM, an integral PWR), in People's Republic of China (HTR-PM, a high temperature gas cooled reactor) and in the Russian Federation (KLT40s, a floating power unit). They are scheduled

to start operation between 2019 and 2022. In addition, the Russian Federation have already manufactured six RITM-200 reactors (an integral PWR) with four units already installed in the Sibir and Arktika ice breakers, to be in service in 2020.

Five categories of SMRs will be presented based on the different types of coolants, fuel design and environment impacts.

Also, the Egyptian resources from thorium ores can be managed for the enhancement of the core design of a typical SMR by using thorium oxide based nuclear fuel. This SMR can be used for sea water desalination, industrial use and for daily life of people collections in locations far from the electric network in Egypt and for sustainable economic development.

4-

RADIOLOGICAL CHARACTERIZATION AND SAFETY DURING DECOMMISSIONING OF A NUCLEAR REACTOR

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Radiological characterization for spent nuclear fuel and structure materials of a nuclear reactor plays an important role in the decommissioning plan. It is the basis for radiation protection and safety of the workers, public and environment. It can support the identification of contamination and assessment of potential risks.

The characterization stages can be distinguished as; pre-operational characterization; characterization during reactor operation; characterization during the transition stage (after final reactor shutdown and fuel transport and before decontamination); characterization during dismantling (including remediation and decontamination); characterization to support the final status survey for safe site release.

Most of the comprehensive characterization activities are usually carried out during the transition stage in preparations for implementation of decommissioning activities, or during the dismantling stage where systems, structures, components and buildings have to be characterized for decisions regarding the extent of decontamination and protection of the people and environment. The first stage of the decommissioning plan is the transport of the nuclear fuel from the reactor site safely. Graded approach using comprehensive accurate software can be used for the calculation of the spent nuclear fuel inventory and activation products in the structure materials of the reactor. Potential radiological accidents during decontamination or

during dismantling should be evaluated, by examining the inventory of radioactive material, reviewing planned activities, and considering a combination of these elements that could lead to a release of radioactive material. The radiological accident considered to present the highest potential consequences was that of a fire during decommissioning activities.

In this paper, a modern state-of-the-art Monte-Carlo code MCNPX 2.7 is used for modeling, characterization and calculation of the source term of OPAL Research Reactor. The inventory of actinide and non- actinide radio-nuclides, amount of fissile materials (U-235, Pu-239 and Pu-241) and activity of each nuclide against its burn-up and cooling time were calculated. The calculations depend on the actual irradiation history, initial enrichment, discharge burn-up, fuel cell array, dimensions, cooling medium and neutron cross section data library. The isotopic composition and activation products can be changed during cooling time as different decay schemes lead to production and destruction of some new nuclides. Also, radiation protection requirements for the public and safety management for the environment in case of emergency exposure during the decontamination and dismantling stages will be discussed based on the international basic safety standards

5-

ASSESSMENT OF RADIOLOGICAL RISK OF PHOSPHATE MINING IN EL-SEBAIYA LOCALITY, ASWAN ZONE, EGYPT USING HPGE SPECTROMETER

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In the present work, the specific activity concentrations of natural radionuclides of ^{238}U and ^{232}Th chains members and 40K were measured by using gamma-ray spectrometric technique based on high-resolution hyper-pure germanium detectors (HPGe) in phosphate samples collected from El-Sebaiya area. The external hazard index (Hex), the external absorbed dose rates (D), the annual effective doses (E) and the excess lifetime cancer risk (ELCR) due to gamma radiation from the samples have been calculated and compared with the average worldwide values. Thee valuations of the

associated radiological hazards from these materials on the workers during the mining processes in the El-Sebaiya area were carried out.

6-

URANIUM EXTRACTION FROM GATTAR GRANITE SAMPLE AFTER LEACHING USING NITRATE SOLUTION IN PRESENCE OF PEROXIDE

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Gattar area is classified as one from the most important Egyptian uranium resources. In this work leaching of uranium from Gattar granitic ore contain 1138 ppm U using $NaNO_3$ solution in presence of H_2O_2 has been applied. Many leaching factors in presence and absent of oxidants include; nitrate were studied and optimized. The obtained data show that, the uranium leaching in absence of oxidants was only 46% then H_2O_2 as an additional oxidant was used. The main role of H_2O_2 is oxidizing the iron content to ferric species which responsible on oxidize the non-leachable U(IV) species to leachable U(VI). Based on the obtained results of 0.005 M $NaNO_3$ in presence of 15 m mol l^{-1} H_2O_2 with 4/1 L/S ratio of 75 ºC for 6 h as optimum leaching conditions, the uranium leaching efficiency was 82%. The leach liquor was then subjected to an extraction step using 4% Alamine 336. Alamine 336 extracted 92.3% from the leached uranium. The resultant solvent was then treated with a carbonate solution for strip the loaded uranium. Finally; the carbonate solution was then treated with NaOH to precipitate the uranium species at pH; 11.5.

7-

NEUTRON ACTIVATION ANALYSIS APPLIED ON NUCLEAR MATERIALS USED IN GEN IV REACTORS

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Institute for Nuclear Research Pitesti, Romania operates two TRIGA type reactors inside the same pool ACPR (Annular Core Pulsed Reactor, 20.000 MW/pulse) and SSR (Steady State Reactor, 14MW maximum power). This reactor, by its structure and utilization, has the ability to allow

different types of samples irradiation inside the core grid in specific experimental locations: beryllium reflector, experimental channels, and some other larger nuclear installation which can be inserted by modifying the reactor core grid. Due to the reason that on institu te's site, the new GEN IV reactor Advanced Lead Fast Reactor European Demonstrator (ALFRED) is settled to be constructed under a European Consortium aegis, there is a critical need for testing new generation of nuclear materials which will be used in lead cooled type reactor. The present work reports on the first test results obtained using Neutron Activation Analysis k0 standardization (NAA-k0) on austenitic DIN 1.4970 (15-15Ti) nuclear cladding steel. The main goal was to compare the elemental concentration of the material provided by the manufacturer with the one obtained experimentally using NAA-k0 and to demonstrate that this method is a reliable one in conducting further experiments on newly developed nuclear materials. On the same time, other trace elements can be detected due to the very low detection limits of the hyper-pure germanium (HPGe) crystal detection system. Key words: Neutron Activation Analysis-k0 standardization (NAA-k0), TRIGA, ALFRED, DIN 1.4970 (15-15Ti), HPGe

8-

THE ENVIRONMENTAL IMPACTS OF TRANSPORTATION SYSTEMS

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Transport is vital for the development of society and an essential element for meeting the challenges of sustainable development. In spite of the vast benefits of transport, it is nearly impossible to utilize without significant environmental impact. Thus, before achieving benefits transportations systems entail the consumption of natural resources; generate harmful effects and polluting emissions that directly and indirectly generate a number of global and local impacts. These include air pollution, water pollution, thermal pollution, toxic pollution, harmful GHG emissions, noise pollution, and the installation of infrastructures that have effects on certain natural spaces and on the flora and fauna of the area. The type and severity of these environmental impacts can vary depending on the type of the transportation system used and its environment degrading capacity. Transport systems are the 2nd responsible for the emission of air pollutants - the major cause of urban air pollution.

The article aims at discussing the environmental impacts associated with some kinds of transportation systems.

9-

HUMIDITY EFFECT ON THE FREE VOLUME PROPERTIES OF PER-FLUORINATED SULFONIC ACID/PTFE PROTON EXCHANGE MEMBRANES

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The yield and lifetime of positronium (Ps) in three different samples of per-fluorinated sulfonic acid/PTFE proton exchange membranes (Fumapem® F-950, F-1050, and F-14100 membranes with ion exchange capacity (IEC) = 1.05, 0.95, and 0.71 meq/g, respectively) for the polymer electrolyte fuel cells investigated by the positron annihilation lifetime (PAL) technique. The high probability of Ps formation enables the study of the free volume and the mechanism of methanol permeation and proton conductivity in Per-fluorinated sulfonic acid/PTFE by the PAL technique as a function of relative humidity. The influence of the free volume size on the properties of the membranes such as water uptake, proton conductivity, and mechanical properties is also investigated. It has been found that the proton conductivity increases with increasing IEC values. The proton conductivity also increases with increasing water content in the membrane, which increases as the humidity increases. There is a good correlation between variations of the free volume and both methanol permeability and proton conductivity with relative humidity indicates the important role of free volume in methanol permeation and proton conductivity for hydrated per-fluorinated sulfonic acid/PTFE proton exchange membranes.

10-

CHITOSAN/PVP/SiO_2 NANO-PARTICLES BLENDS AS MEMBRANES FOR DIRECT METHANOL FUEL CELL APPLICATIONS

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A fuel cell is considered to be a future promised source of power due to producing electricity without producing a harmful product. The Polymer electrolyte membrane (PEM) was considered to be the heart of the fuel cell. It acts as a transporter for the proton and the separator between the anode and cathode. The membranes were synthesized using chitosan (CS) and poly(vinyl pyrrolidone) (PVP) with different concentration of SiO_2 nano-particles by casting method. The prepared membranes were sulfonated by adding the SO_3 groups which are responsible for proton conductivity through the PEM. The ion exchange capacity (IEC), ionic conductivity, tensile strength, and methanol permeability were measured for the prepared PEMs. The free volume holes control the diffusion rate of gases or molecules through polymer membranes. The size and distribution of the Nano-holes in the PEMs were determined using positron annihilation lifetime spectroscopy (PALS). From PALS results it was found that there is a strong correlation between water uptake, proton conductivity, and tensile strength with the free volume size of the membrane.

11-

SYNTHESIZE AND CHARACTERIZATION OF NONPRECIOUS METALS/CARBON NANOFIBERS ELECTROCATALYSTS WITH LOW Pt FOR FUEL CELL APPLICATIONS

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Recently, fuel cells (FCs) have been identified as promising power sources for vehicular transportation and for other applications requiring clean, quiet, and portable power. Hydrogen-powered fuel cells, in general,

have a high-power density and are relatively efficient in their direct conversion of chemical energy to electrical energy. Exhaust from hydrogen-powered fuel cells is free from environmentally undesirable gases such as nitrogen oxides, carbon monoxide, and residual hydrocarbons that are commonly produced by internal combustion engines. In this study low ratio of platinum LPt-doped metallic/carbon nanofibers (Pt-Ni-Co/CNFs) as electrocatalysts were prepared by electrospinning technique using composed of poly (vinyl alcohol), Nickel acetate, Platinum chloride and Cobalt acetate. The electrospun nanofibers were firstly dried for 24 h at 80°C under vacuum then carbonized in a tube furnace at 900°C for 5h in argon atmosphere and holding time of 2h. The phase and crystallite size for the two nanostructures were determined using XRD. The average crystallite size of the metals was much smaller than the diameter of carbon fibers, indicating that the metals particles could be easily dispersed in the fibers. It was observed from the scanning electron microscope (SEM) image that the PVA/PtCl-$Ni(OAc)_2$-$Co(OAc)_2$ precursor nanofibers exhibited relatively smooth surface morphology and straight fiber structure. The TGA analysis indicated the thermal stability properties of the composite nanofibers and nanoparticles. Cyclic voltammetry (CV) was used to investigate the effects of the catalyst on the reaction kinetics. The experimental results indicated that the introduced catalysts have distinct electrochemical catalytic activity in alkaline medium.

12-

PREPARATION AND CHARACTERIZATION OF V_2O_5/ PVC/PMMA NANOCOMPOSITES FOR FUEL CELL APPLICATION

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Direct methanol fuel cells (DMFCs) are very attractive as energy supply devices for vehicular transportation and other applications, thanks to their environmentally friendly features and high efficiency. As the vital component in fuel cells, polymer electrolyte membranes (PEMs) play multiple roles, including conducting protons, preventing methanol leakage

to the counter compartment and blocking the transfer of electrons, Nanocomposite membranes (V_2O_5/PVC/PMMA) were prepared by solution casting method with different concentrations of V2O5 from 0.5 to 2 wt %.

The prepared membranes were sulfonated by using sulfosulfonic acid which is responsible for proton conductivity. Positron annihilation lifetime technique was used to investigate the free volume holes. The influence of free volume size on the properties of the membranes such as water uptake and proton conductivity is also investigated.

13-

SHIELDING OUTLINES OF A HIGH ACTIVITY ^{241}Am-Be MULTI-SOURCE MIXED-FIELD IRRADIATION FACILITY

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Neutron and gamma-ray shielding design for a 30 Ci ^{241}Am-Beirradiation facility is studied. The study focuses on the optimization of the shielding layers of the previously planned neutron irradiation facility. The shielding design aims at reducing the workers effective absorbed dose rate to 10 Sv/h, according to the recommended limit of ICRP-103. Dose calculation considers not only ^{241}Am-Be produced neutrons but also gamma-rays from the ^{241}Am decay, ^{12}C* de-excitation, and neutron interaction with source and facility materials. Different materials (paraffin, borated-paraffin, beryllium, copper, tantalum, tungsten, zinc, bismuth and lead) have been studied as neutron and gamma shields using MCNP-5 simulation. The choice of shielding materials is based on the cost and total weight of the facility. Among several configurations, a shielding layer consists of 10 cm paraffin-wax, 2.5 cm lead, and 31.5 cm borated-paraffin wax is found sufficient to meet the safety requirements, leading to a cubic facility of 104.5 cm overall length.

14-

EFFECT OF THE HEAT TREATMENT ON THE CORROSION BEHAVIOR OF THE DUPLEX AND 304 STAINLESS STEELS

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Heat treatment is necessary for stainless steel (SS) to remove or dissolve intermetallic phases, to remove segregation and to relieve any residual thermal stress in SS. The effect of heat treatment on the corrosion behavior of of the duplex and 304 stainless steels in 3 % NaCl solution was studied in this work. The duplex and 304 stainless steels samples were heated at 1100 0C astonished temperatures for 60 minutes and water quenching. After that, the samples were heated at 700 0C for 1, 2 and 3 hour. These samples were then immersed in 3 % NaCl solution. The results show that the optimum condition at 1100 0C austenized temperature /1h quenching water and was heated at 7000C /3h.

15-

THIN LAYER KIESERITE BASED SOLAR CELLS (CZTS) USING EARTH ABUNDANT ELEMENTS

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Recently, a lot of attention has been given to the link between the rise in fossil fuel consumption, CO_2 emissions, and the average temperature of the planet. Multiple models have shown that if this trend is allowed to continue, the consequences for the environment could be quite significant. Furthermore, even if we are able to reduce our consumption of fossil fuels and reduce the CO_2 levels, it will not change the fact that fossil fuels are a limited resource and are likely to be exhausted within the next 100- 150 years. Addressing this problem will require the development of a renewable source of energy that is carbon neutral. Solar radiation is one of the most abundant forms of energy available on the planet, but harnessing this energy has been hampered by the high costs of current solar technologies. These costs stem from the use of non-optimal (silicon), toxic (cadmium) and expensive (indium) materials. To further reduce the costs of solar energy, an earth abundant, non-toxic and inexpensive material is required that can make this energy source competitive with fossil fuels. Previous work on

$Cu_2ZnSn(S/Se)_4$ (CZTS/Se) has shown that it is an excellent candidate for use in thin film solar cells due to its earth abundant, inexpensive, non-toxic constituents and optimal material properties. Thin film solar technology (second generation) was developed as a response to the high material usage and costs of silicon solar cell CdS is the n-type semiconductor in the p-n junction and it is usually referred to as buffer layer. Herein we intend to replace this buffer layer by of toxic CdS with eco-friendly zinc sulphide (ZnS) and to enhance the performance of this layer by cation doping. Zinc sulphide layer was and copper doped zinc sulphide layers were prepared by Sol-gel method which is simple, cost-effective, and ecofriendly method. The optical and physical properties of the prepared materials were investigated

16-

RECOVERY OF COPPER AND RARE EARTH ELEMENTS FROM THE PROCESSED ALLOGA CARBONACEOUS SHALE, SOUTHWESTERN SINAI, EGYPT

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The present work is concerned with the recovery of Cu and REEs from the processed Alloga carbonaceous shale (almost free from U) of Abu Zeneima area at Southwestern Sinai using H_2SO_4 acid agitation leaching method. The working processed sample assays 0.18% Cu and 0.068% REEs. The applied optimum leaching conditions realized dissolution efficiencies of 91.2% for Cu and 99.1% for REEs.

For selective separation of Cu, LIX973N diluted in kerosene was used. Cu was regenerated from the loaded organic phase under the optimum stripping conditions of 12% H_2SO_4 acid with shaking time of 3 min at A/O ratio of 1/1 and then precipitated directly as $Cu(OH)_2$. With respect to REEs extraction, the raffinate solution left behind after Cu recovery and assayed 0.16 g/L of REEs was subjected to Dowex50 W-X8 cation- exchange resin in its hydrogen form realizing loading efficiency of 79.5%. About 99% of eluted REEs was precipitated by the addition of 10% oxalic acid at pH of 1.1. A flowsheet for the preparation of CuO and RE_2O_3 was proposed.

Key words: Alloga, Copper, Rare Earth Elements, LIX973N, Dowex50 W-X8, H_2SO_4

17-

EVALUATION OF GAMMA- AND ELECTRONS- IRRADIATION EFFECTS IN ORGANIC, INORGANIC AND BIOLOGICAL SUBSTANCES

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The pattern of radiation energy deposition in substances at the microscopic level unit lattice, molecule size, or the cell's nucleus is not uniform. Microscopically, the energy of radiation is transferred to the substance medium in the form of discrete, time-dependent, spatially correlated events in which excitations and/or ionizations are part of the processes involved. Such difference in microscopic level affects the response of material on the macroscopic level making difference among irradiation effects in organic, inorganic, and biological substances. Average macroscopic quantities, such as absorbed dose or stopping power may be of some degree of applicability at the microscopic level. The response of physical materials and a biological system to radiation is related to the local microscopic distribution of excitations and ionizations along the path of the particle in the affected volume. For liquid and living cells, both the slow (indirect) and fast (direct) processes have a comparable function.

18-

A STUDY OF ^{226}Ra CONCENTRATION RATIOS FOR LEAFY VEGETABLES

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The aim of this work was 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 ground waters. 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.

19-

NUCLEAR FUEL FOR POWER AND RESEARCH REACTORS

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Nuclear fuel is the material used to derive the nuclear fission chain reactions in the nuclear reactor. This material in almost all the present nuclear reactors is uranium since it is the only nuclear fuel that occurs naturally; natural uranium contains the fissile isotope ^{235}U (0.72%).
The processes applied to produce fuel for nuclear reactors, to use this fuel in the reactor and to handle the used or spent fuel comprise the elements of the nuclear fuel cycle.
These processes may be divided into the following main activities:
Front End: uranium exploration, mining and milling (uranium concentration) refining and conversion of the uranium concentrate, enrichment (if applicable), and fuel fabrication.
Fuel Management (in the reactor)
Back End: Spent fuel management, reprocessing (if applicable), and Nuclear waste management.
This paper is concerned mainly with the manufacturing the fuel elements of light water power reactors and research reactors.

20-

IMPROVING THE ANALYSIS PERFORMANCE OF GAMMA SPECTROMETER USING THE MONTE CARLO CODE FOR ACCURATE MEASUREMENTS OF URANIUM SAMPLES

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Uranium quantification and measurements represent a vital task for all used nuclear materials in nuclear technology. This work emphasizes the improvements and optimization of gamma spectrometer performance based on estimation techniques. The optimization was carried out for accurate uranium samples characterization based on modeling using the Monte Carlo code (MC). The used samples are certified and nuclear materials. The measured masses were determined based on non-destructive method using a germanium detector. Using the initial MC model based on the nominal detector parameters, wide discrepancies up to 55% between measured and simulated results were obtained. Consequently, the calculated uranium masses have a high relatively var- iations up to 35% than the reference values. To overcome such variations, the MC model was developed through optimization of the detector dimensions. A good agreement between the results of the MC optimized model and the certified values has been obtained with a variation less than 2%.

21-

RECOVERY OF URANIUM FROM CARBONATE SOLUTIONS USING MODIFIED DOWEX 1X8 /TOA

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Leaching of uranium from a technological sample (680 mg/Kg U) in SW Sinai of Um Bogma Formation is carried out by mixture sodium carbonte/sodium bicarbonate in presence of an oxidant. The relevant factors of alkaline leaching of uranium have been optimized. This is followed by uranium recovery using anion exchange resin as modified Dowex 1X8/TOA. Therefore, highly pure product of uranium has been obtained.

Keywords: Uranium**,** sodium carbonate, sodium bicarbonate, Dowex 1X8 and TOA.

22-

CHARACTERIZATION OF NIS NEUTRON IRRADIATION FACILITY FOR CALIBRATION AND METROLOGICAL APPLICATION

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In this study, the Neutron Irradiation Facility (NIF) of the National Institute of Standards (NIS) was characterized for metrological applications to improve the accuracy of calibration Process. The NIS neutron irradiation facility consists of a 5 Ci Am-Be and 0.1 µgm Cf-252 sources. The flux and dose rate of the Am-Be source was calculated by simulating using MCNP5 code for different distances from the source. The dose rate delivered by the source was determined using NM2-neutron monitor at different source-to-detector distances. A comparison between the measured and the calculated dose rate was performed and the deviation between them was explained in the skeletal arrangement of room scattering contribution. A shadow cone was designed and constructed to determine the scattering contribution at different source-to-detector distances. The optimum source-distance used for calibration was specified. It was found that the calculated flux of the Am-Be source was varied with distance from about 10^7 to 10^4 (n/cm^2.sec). The measured and calculated dose rates were in agreement to 150 cm from the source center and then the measured dose is greater than that calculated one. The determined neutron scattering from the measured-to-calculate dose ratio increases from 7 to 25 % with a distance increases from 150 to 300 cm. Moreover, the standard dose used in the calibration process should be measured by a standard neutron monitor at each distance due to the higher value of the room, scattering contribution and the optimum distance for calibration processes is 150 cm. The combined uncertainty of the measured neutron dose was 3.7%.

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CHEMICAL TREATMENT OF EL MISSIKAT FLUORITE-BEARING ORE MATERIAL, EGYPT, FOR RECOVERY OF PURE YTTRIUM OXIDE

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El Missikat fluorite-bearing ore material, Eastern Desert, Egypt, has been identified as containing quantity of heavy rare earth elements (REE) as yttrium fluorite mineral. Rare earth concentrate prepared from sulfate solution of El Missikat fluorite- bearing ore material which assays 0.615% of REE. The solution was prepared from ore material by two subsequent thermal steps namely; fluorine deactivation by MgO and roasting by $(NH_4)_2SO_4$.The deactivated roasted matrix was leached with hot distilled H_2O to prepare the solution which assays 0.846g/L of REE. This solution was treated with 20g of oxalate acid to produce impure RE oxalate cake which ignited at 950°C.It was then dissolved in concentrated HNO_3 to prepare the RE nitrate solution for extracting yttrium by using tri butyl phosphate (TBP) in kerosene. The produced yttrium oxide was of 97.2% purity.

Keywords: Yttrium, Extraction, TBP, Fluorite- bearing ore material.

24-
NUCLEAR ELECTRICITY FOR EARTH PRESERVATION
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من المؤكد أن محطات القوى بالوقود الاحفورى المحترق – والتى يبلغ اسهامها فى توليد الكهرباء العالمية حوالى 70 % - هى أكثر أنواع محطات توليد الكهرباء "عداوة" للبيئة ، حيث ينفث الوقود المحترق إلى الهواء المحيط غاز ثانى أكسيد الكربون بكميات كبيرة ، فمع توليد واحد كيلو وات ساعة كهرباء (1kW.h) من الغاز الطبيعى ينبعث حوالى 525 جرام من CO_2 أو حوالى 0.27 متر مكعب (270 لتر) من هذا الغاز الضار، وينبعث 607 جرام من ثانى أكسيد الكربون CO_2 مع توليد 1kW.h من الغاز المسيل LPG ، و 730 جم CO_2 عند استخدام النفط الطبيعى وأكثر قليلا عند استخدام المازوت ، وأكثر من 900 جم عند استخدام الفحم الأسود ، وتصل كمية ثانى أكسيد الكربون المنبعثة أثناء توليد 1 كيلو وات ساعة كهرباء من الفحم البنى إلى كيلو جرام وربع.
وكما هو معروف للمتخصصين فإن تأثير التشغيل الآمن العادى للمفاعلات النووية على الانسان والبيئة غير ضار، إذ لا يسبب فى انبعاث لأي غازات احتباس حرارى ، كما لا يبعث بأى إشعاعات نووية مؤينة على بعد أمتار من جدران وعاء المفاعل ، أما مخلفات التشغيل من الوقود المستهلك فتخزن عادة فى أحواض ماء مخصصة لذلك موجودة داخل مبنى المفاعل تسع لتخزين الوقود المستعمل خلال عمر المفاعل ، ولا تمثل أى مشاكل خلال التشغيل الآمن مع تزايد إمكانية الاستفادة منها لتصنيع الوقود الطازج أو تجهيز مصادر مشعة مفيدة .

25-
ECO-FRIENDLY ZNS BUFFER LAYER FOR THIN FILM SOLAR CELL APPLICATIONS
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Thin film solar technology (second generation) was developed as a response to the high material usage and costs of silicon solar celCdS is the n-type semiconductor in the p-n junction and it is usually referred to as buffer layer. Herein we intend to replace this buffer layer with toxic CdS with eco-friendly zinc sulfide (ZnS) and to enhance the performance of this layer by cation doping. Zinc sulfide layer was and copper doped zinc sulfide layers were prepared by the Sol-gel method which is a simple, cost-effective, and eco-friendly method. The optical and physical properties of the prepared materials were investigated via UV-Vis, XRD, SEM, and EIS techniques.

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IMPLEMENTATION OF NUCLEAR KNOWLEDGE ANAGEMENT PROGRAM ON RADIOACTIVE WASTE MANAGEMENT
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Nuclear power remains an important option for many countries to improve energy security, provide energy for development and fight climate change. The greenhouse gas emissions from nuclear power plants and are much smaller than those associated with coal, oil and natural gas, and the routine health risks are much smaller than those associated with coal. The nuclear power generation constitutes the intermediate phase between the front and back-ends of the nuclear fuel cycle. But, there are in this intermediate phase routine releases of radionuclides to the surrounding environment in liquid and gaseous forms. A major environmental concern related to nuclear power is the creation of radioactive wastes such as uran ium mill tailings, spent fuel from the reactors, and other radioactive wastes. These materials can remain radioactive and dangerous to human health for thousands of years. Radioactive wastes are subject to special regulations that govern their handling, transportation, storage, and disposal to protect human

health and the environment from the hazards of radioactive elements. Nuclear Knowledge Management at the project, organizational and national levels is an integrated and systematic approach applied to all stages of the knowledge cycle, including its identification, sharing, protection, dissemination, preservation and transfer. Knowledge management systems support nuclear organizations in strengthening and aligning their knowledge. Knowledge is the nuclear energy industry's most valuable asset and resource, without which the industry cannot operate safely and economically. In the organizational context, nuclear knowledge management supports the organizations business processes, and involves applying knowledge management practices. These may be applied at any stage of a nuclear facility's life cycle: research and development, design and engineering, construction, commissioning, operations, maintenance, refurbishment and life time extension, decommissioning and waste management. Here in this paper we will perform the implementation of nuclear knowledge management program on radioactive waste management.

27-

OPTIMIZATION OF VENTILATION IN PHARMACEUTICAL CLEANROOMS

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The high Air Change Rates (ACRs) required for cleanrooms make them energy-intensive. This research elaborates on three strategies for energy efficient ventilation in pharmaceutical cleanrooms: Fine-tuning, Demand Controlled Filtration (DCF), and optimizing airflow pattern. To study the possibilities for fine-tuning and DCF, two case studies were investigated and simulations were performed to assess the potential of both options. Experiments in a demonstration cleanroom were used to examine how an ideal airflow pattern may be achieved in the cleanroom, resulting in a high contaminant removal efficiency. Results showed that DCF could lead to substantial energy savings, up to 93.6% in the specific case study facilities. Besides this, DCF based on occupancy could be implemented with negligible effect on the environmental cleanliness requirements. Fine-tuning, based on particle concentration, required representative measurement of the concentration in the cleanroom. It was more difficult to implement in practice. With respect to contaminant removal efficiency, best results (within the experiments performed, ACR in the range of 16 h^{-1} –38 h^{-1}), were obtained when the air was supplied without a diffuser above the product area and when the work position was located close to the air extraction grilles.

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STUDYING AND SIMULATION OF CLEAN AREA FOR TC99M PRODUCTION IN RADIOISOTOPE PRODUCTION FACILITY

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Clean areas nowadays are advanced technology solutions with very high standard and criteria applied on air quality level. Egyptian Radioisotopes Production facility (RPF) is a facility that requires clean area to produce technetium (Tc99m) isotope for medical purposes. The air cleanliness inside area is dependent on the air quality of supplied air, contaminant and pollutant sources, dedicated ventilation system in addition to rigorous precautions to sterilize space of the area and commitment to follow standard recommendations. Two main standard classes are available in production area, A and C according to ISO 14644-1. Our paper deals with class C in which isotope is produced and some tests are conducted to know particle counts in that area in addition to prediction of these counts by computer simulation Contam-CFD0 program, which predicts transient particles count behavior. It is compared with standard WHO values and measurements for validation. Biological tests are also implemented to monitor sterility of area to confirm cleanliness and validity for processing medical radioisotope. High efficiency particulate air filters with class H14 are dedicated for the clean area and equipped with pressure drop manometer for replacement in case of blockage. Simulation program is also used to predict particles concentration in case of filter contamination.

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Notes

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Conference Timetable

Time	Fri ., 26 Mar.	Time	Sat., 27 Mar.	Sun., 28 Mar.	Fri., 29 Mar.
		08:00 09:00	Breakfast	Breakfast	Breakfast
9:30	Arrival Aswan	09:30	Aswan	Edfu	**CS** /Disemb.
10:00	Aswan	11:30 13:00	Tour-2	Temble	Luxor
13:00	Tours-1	13:00 - 14:00	Lunch Kom Umbo Temple	Lunch Esna Lock	West
13:30 - 14:30	Embarc. Lunch	14:00 - 15:30	**Oral-2**	**Oral-4** Luxor	Bank
18:30 - 20:00	**OS/** **Oral-1**	18:00 - 19:30	**Oral-3/Poster**	Luxor West Bank	Departure to Cairo
21:00 - 23:00	Free Evening		Cult Evening	Cult Evening	

Programme abbreviations:

OS	Opening Session	**Poster**	Poster Session
Oral	Oral Session	**CS**	Closing Session

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