Ministry of Defence
Military Technical College

THE 10th INTERNATIONAL CONFERENCE OF
THE MILITARY TECHNICAL COLLEGE

Abstracts of Scientific Papers,

The 10th International Conference
On Chemical and Environmental Engineering
7 - 9 July, 2020
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PREFACE

The military Technical College is honored to organize the 10th International Conference on Chemical and Environmental Engineering (ICEE) in the period 7-9 July, 2020 sponsored by the Egyptian Ministry of Defense. The conference provides a valuable opportunity to exchange, update the knowledge and stimulate discussions on recent developments and research activities.

Accepted papers are arranged in the following sessions:

1. Nanotechnology and its chemical Applications (NCA)
2. Energetic Mat. and its Applications (EMA)
3. Chemical Engineering Applications (CEA)
4. Environmental Studies and Pollution Control (ESPC)
5. Water and Waste Water Treatment By Synthetic Polymers And Adsorbents (WWWT)
6. Nuclear and Radiometric Applications (NRA)
7. Extraction Techniques of Nuclear Materials (ETNM)

We are highly indebted to all conference contributors. Also, the effort of the scientific committee is highly appreciated.
Military Technical College
Kobry El-Kobbah,
Cairo, Egypt

10th International Conference on
Chemical & Environmental Engineering
7 - 9 April, 2020.

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- Lt. Col. Mahmoud Abd El Hafiez
CONTRIBUTORS

1. Egyptian Universities and Organizations

1. Assiut University, Faculty of Engineering, Mechanical Engineering Department
2. British University in Egypt, Elshorouk City, Cairo, Egypt.
3. Basic Engineering Science Department, Faculty of Engineering, Menoufia University, Shebin El-Kom, Egypt
4. Center of Metallurgy Research and Development Institute
5. Chemical Engineering Branch, Military Technical College, Cairo, Egypt
6. Chemical Engineering Department, Faculty of Engineering, Cairo University, Egypt
7. Chemical engineering department, faculty of engineering, Minia University, Minia, Egypt.
8. Chemical Engineering Department, Military Technical College, Cairo, Egypt
9. Department of Petroleum Applications, Egyptian Petroleum Research Institute, Nasr City, P.O. Box 11727, Cairo, Egypt.
10. Chemical engineering department, British University in Egypt (BUE).
11. Chemistry Administration, Cairo, Egypt.
12. Chemistry Department, Faculty of Science, Alexandria University, Alexandria, Egypt.
13. Corrosion Control and Surface Protection Lab, Central Metallurgical R & D Institute, Cairo, Egypt forzeinab@yahoo.com
14. Cyclotron project, Nuclear Physics Department, Nuclear Research Center, Atomic Energy Authority, Egypt
15. Department of Botany, Faculty of Science, Zagazig University, Egypt.
16. Department of Chemistry, Faculty of Science, University of Mansoura, Egypt.
17. Department of Science and Mathematical Engineering, Faculty of Petroleum and Mining Engineering, Suez University, Suez 43521, Egypt
18. Department of Uranium Ores Processing, Production Sector, Nuclear Materials Authority
19. Egypt Nuclear and Radiological Regularity Authority (ENRRA)
20. Egyptian Armed Forces, Cairo, Egypt
21. Egyptian Atomic Energy Authority, Cairo, Egypt
22. Entomology Department, Faculty of Science, Cairo University, Egypt.
23. Environmental Geology, water and microbiology lab, Chemistry Administration
24. Faculty of petroleum and mining engineering, Suez University, Suez, Egypt
25. Geology Department, Assiut University
26. Geology Department, Assiut University
27. Geology Department, Faculty of Science, Ain Shams University, Egypt.
28. Geology Departments, Faculty of Science, Sohag University, Sohag, Egypt.
29. Glass Research Department, National Research Centre, Dokki, Cairo, Egypt
30. Medical Laboratory Department, Faculty of Allied Medical Sciences, Pharos University in Alexandria, Egypt.
31. Metallurgical and Materials Engineering Department, Faculty of Petroleum and Mining Engineering, Suez University, Suez 43521, Egypt
32. Military Technical College, Kobry Elkobbah, Cairo, Egypt
33. Mining and petroleum Dep., faculty of Engineering, Al-Azhar University, Cairo.
34. Nuclear Materials Authority, P.O. Box 530 El-Maadi, Cairo, Egypt.
35. Oil and Green Chemistry Research Centre / Enhanced Oil Recovery Laboratory, Suez University, Suez, Egypt
36. Ore Processing Department, Nuclear Materials Authority, P.O. Box 530, Cairo, Egypt.
37. PVT Laboratory, Production Department, Egyptian Petroleum Research Institute (EPRI), Cairo, Egypt.
38. Radiation Measurements Branch, Main Defense Chemical Laboratory, Cairo-Suez Road - Almaza, Cairo Egypt.
39. Research Department, Nuclear Materials Authority, Cairo, Egypt.
40. School of Ships and submarines engineering, Military Technical College, Cairo, Egypt.
41. Science and Technology Center of Excellence (STCE), Egyptian Military Production Authority, Egypt.
42. Technical Research Center, Cairo, Egypt.

II Arab and Foreign Universities and Organizations

1. Water Resources Research Center, DPRI, Kyoto University, Japan
# REVIEWERS

|   |                    |                                                      |
|---|--------------------|------------------------------------------------------|
| 1 | Amr M.I. Kany      | Faculty of Science, Al-Azhar University              |
| 2 | Sayed Ali El-Mongy | Nuclear Regulatory Authority (ENRRA)                 |
| 3 | R. M. Megahid      | Nuclear Research Centre, Atomic Energy Authority     |
| 4 | M. Mahmoud El-Oquer| Faculty of Science, Al-Azhar University              |
| 5 | Ahmed A. Baraka    | Chemical Engineering Department, MTC                 |
| 6 | Ahmed Farghal Tawfik| Chemical Engineering Department, MTC                 |
| 7 | Mohamed S. El-Deab | Faculty of Science, Cairo University                |
| 8 | Hussein S. Hegazy  | National Research Centre, Dokki, Giza, Egypt         |
| 9 | Mohamed A. Gobbara | Chemical Engineering Department, MTC                 |
|10 | M. Kassem Abdel-Magid | Chemical Engineering Department, MTC               |
|11 | Mohamed Abo-El fotoh Elsayed | Chemical Engineering Department, MTC       |
|12 | Mohamed I. Awaad   | Chemical Engineering Department, MTC                 |
|13 | Nabeel M. Abdel-Monem | Cairo University of Engineering                   |
|14 | Sherif Fahmy Mahmoud | Faculty of Medicine, Al-Azhar University          |
|15 | Sherif Sh. El-Bassuny | Chemical Engineering Department, MTC              |
|16 | Zaynab Abdel-Hameed | Central Metallurgical R & D Institute, Cairo, Egypt |
|17 | Hisham Tantawy     | Chemical Engineering Department, MTC                 |
|18 | Said A. Hassanein  | Chemical Engineering Department, MTC                 |
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|20 | Mahmoud El-Ahdal   | Nuclear Research Centre, Atomic Energy Authority     |
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|22 | Salah El Mofly     | Cairo university Mining Engineering Department     |
|23 | M. Amin El-Sahir Sadek | British University in Egypt                     |
|24 | Mahmoud Yossery    | Chemical Engineering Department, MTC                 |
|25 | Mona Mostafa Mahmoud | Faculty of physics Minia university           |
|26 | Samah Ibraheem Radwan | Atomic Energy Authority, Cairo Egypt            |
|27 | Mahmoud Abd El Hafeez | Chemical Engineering Department, MTC            |
|28 | Mohamed Y. Hassaan | Faculty of science Azahar University               |
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|30 | Mostafa Radwan     | British University in Egypt                        |
|31 | M. Mohamed El Dosokey | British University in Egypt                     |
|32 | A. Salah El-Din El-Kholany | Pharos University in Alexandria, Egypt         |
|33 | Osama Ali Abuzalat  | Chemical Engineering Department, MTC                 |
|34 | Mohammad Husain Sammour | Chemical Engineering Department, MTC             |
|35 | Ahmed El sayed Azazy | Science and Technology Center of Excellence, Military production |
|36 | Magdy M. Hassan Senna | Atomic Energy Authority, Cairo Egypt.             |
SCIENTIFIC SESSIONS
Session No 1
Nanotechnology and its chemical Applications
(NCA)

Room: N
Date: Tuesday, 7/7/2020
Time: 11:00 – 12:45
Board: Prof. Dr. / Magdy Foad Abadeer Cairo Univ.
Maj.Gen.(R)Prof.Dr./Hosam El Sayed Mostafa MTC
Col. Dr. / Shreif Shaaban Elbasuney MTC

001-ICEE-10
Synthesis of High-Quality Multi-Walled Carbon Nano-Tubes (MWCNTs) by Injection Chemical Vapour Deposition; The effect of pyrolysis temperature on MWCNTs
Mohamed Abouelfotoh Elsayed; Omar Ibrahim Abdel aziz; Tamer Z.Wafy; Mahmoud Abdelhafiz

002-ICEE-10
Synthesis and Characterization of BaFe12O19 Ferrite Nanoparticles from Iron Ore Waste and Their Possible Application in Water Treatment
Nehal A. Erfan*a, Salwa A. M. Abdel-Hameedb, Asma A. Mohammeda

003-ICEE-10
Thermal Properties of Nano Tungsten - Ethylene Vinyl Acetate (EVA) Composites
M. Sobhy*, Alaa I Eid**, W. M. Khairaldien***

004-ICEE-10
Catalytic Oxidation over Nanostructured Heterogeneous Process as an Effective Tool for Environmental Remediation
Rahma H. Thabet1, Maha A. Tony1*, Mai K. Fouad2, Shakinaz A. El Sherbiny3, I. A. Ali3
Synthesis of High-Quality Multi-Walled Carbon Nano-Tubes (MWCNTs) by Injection Chemical Vapour Deposition; The effect of pyrolysis temperature on MWCNTs

Mohamed Abouelfotoh Elsayed; Omar Ibrahim Abdel aziz; Tamer Z.Wafy; Mahmoud Abdelhafiz

Abstract

Production of high-quality Muti-Walled Carbon Nano-Tubes (MWCNTs) is essential for achieving desired fields, especially in medical and mechanical applications. This work illustrates the synthesis of high quality (MWCNTs) by Injection Chemical Vapour Deposition (Inj-CVD) method using the optimum concentration of Ferrocene dissolved in Toluene solution as a carbon precursor. The effect of pyrolysis temperature, which has a pivot impact on the synthesis process, was investigated. The structure defects, impurities, yield, and sample morphology, as well as the mean diameters of the MWCNTs, were analyzed using Raman spectroscopy, thermal gravimetric analysis (TGA) and scanning electron microscope (SEM), respectively. The results revealed that the change of quality, mean diameter and purity were observed when the pyrolysis temperature increase between 700°C to 850°C. High-quality carbon Nanomaterial was observed by Raman spectroscopy at a pyrolysis temperature of 700°C. While the Transmission electron microscope (TEM) was used to confirm that this product is MWCNTs with 24±5nm, 7.8±1.5nm outer and inner diameter, respectively. The Inj-CVD achieves excellent control of the carbon to catalyst ratio.

Keywords:
High-quality Carbon Nano-tubs, Effect of temperature on CNTs and Characterization of CNTs

1Military Technical College, Kobry ElKobbah, Cairo, Egypt
Synthesis and Characterization of $\text{BaFe}_{12}\text{O}_{19}$ Ferrite Nanoparticles from Iron Ore Waste and Their Possible Application in Water Treatment

Nehal A. Erfan$^a$, Salwa A. M. Abdel-Hameed$^b$, Asma A. Mohammed$^a$

Abstract

In this work hard magnetic glass ceramics has been fabricated using Egyptian Bahariya oasis ore; which contains not less than 51% of its weight as pure iron. High energy planetary ball mill was used to convert the prepared magnetic sample into nanoparticles. Different mechanical milling times were applied to study its effect on the properties of the produced magnetic glass ceramic. SEM, TEM, XRF, DTA, XRD, Raman spectroscopy and VSM analysis techniques were performed to characterize the prepared glass ceramic samples before and after exposing to mechanical milling process. XRD revealed crystallization of barium hexa-ferrite as major phase with average crystallite size ~26 nm. Saturation magnetization Ms depicted 21.2 emu/g after 5 hours milling. The produces nanoparticles after 5 hours milling showed a good performance in removal of pollutants like methylene blue and Congo red from water by adsorption.

Keywords:
Magnetic glass ceramics; Ball milling; Barium hexa-ferrite; nanoparticles; Iron ore, Waste; Recycling

$^a$Chemical engineering department, faculty of engineering, Minia university, Egypt.
$^b$Glass Research Department, National Research Centre, Dokki, Cairo, Egypt
Thermal Properties of Nano Tungsten - Ethylene Vinyl Acetate (EVA) Composites

M. Sobhy*, Alaa I Eid**, W. M. Khairaldien***

Abstract

Ethylene vinyl acetate (EVA) with different percentage of nano tungsten powder (0wt%, 30 wt%, 45 wt%, 60 wt%, and 70 wt%) composites(EVA/W nano-composites) were prepared by melt blending in a twin-screw brabender. The structural, morphological, thermal and mechanical properties of the prepared nano-composites were investigated using powder X-ray diffraction (PXRD), Scanning Electron Microscopy (SEM), and thermogravimetric analysis (TGA). It was found that the EVA composites show a higher thermal stability at high levels of tungsten loading.

Keywords:
EVA, Nano tungsten powder, higher thermal stability

*Science and Technology Center of Excellence (STCE), El- Salam City, Cairo, Egypt
**Center of Metallurgy Research and Development Institute
***Asiut University, Faculty of Engineering, Mechanical Engineering Department
Correspondence to: Maged Sobhy; e-mail: maged@stce-egypt.org
Catalytic Oxidation over Nanostructured Heterogeneous Process as an Effective Tool for Environmental Remediation

Rahma H. Thabet¹, Maha A. Tony¹*, Mai K. Fouad², Shakinaz A. El Sherbiny², I. A. Ali³

Abstract

Industrialization has led to a severe deterioration in water quality. Textile industry is considered a huge consumer of water in Egypt, the result is generating large amounts of dye-containing wastewater that is essential to be treated before the final disposal. However, searching for an efficient treatment is an important aspect for a sustainable environment. Advanced oxidation processes (AOPs) have been emerged as efficient techniques for industrial wastewater remediation. Among the AOPs, Fenton based reactions is considered a promising process for its simplicity in application and cost-efficient with high process efficiency. In this study, heterogeneous Fenton reaction using magnetite nanoparticles induced by ultraviolet radiation (UV) was applied as a green technology pathway for textile dying wastewater oxidation. Nanosstructured magnetite was successfully synthesized by co-precipitation method that is used as the precursor of the Fenton’s reaction process. The heterogeneous iron (Fe²⁺/Fe³⁺) supported catalyst with hydrogen peroxide (H₂O₂) was used as a coupled Fenton and Fenton-like oxidation system for methylene blue dye removal in aqueous media. The obtained results investigated that the dye oxidation rate increases with decreasing pH to 3.0. However, increasing H₂O₂ and magnetite nanoparticles catalyst results in an increase the dye oxidation rate and the optimum operating values were 80 and 1600 mg/L for Fe₃O₄ and H₂O₂, respectively. By optimizing the amount of reactants and process conditions, the results revealed that magnetite was considered an efficient Fenton-based catalyst for dye oxidation that is reached to 94% within 3 hr of oxidation time. Finally, magnetite catalyst could be easily recovered by magnetic separation to confirm the process sustainability.

Keywords:
Fenton’s reagent, Methylene blue, Wastewater, Nanomaterial, Magnetite

¹Faculty of Engineering, Menoufia University, Shebin El-Kom, Egypt
²Chemical Engineering Department, Faculty of Engineering, Cairo University, Egypt
³Cyclotron project, Nuclear Physics Department, Nuclear Research Center, Atomic Energy Authority, Egypt
* corresponding author: Tel: +2048-2221549, Fax: +20482235695, Egypt, E-mail: dr.maha.tony@gmail.com
### Session No 2

**Energetic Materials and its Applications**  
(EMA)

**Room:** N  
**Date:** Tuesday, 7-7-2020  
**Time:** 13:00 – 14:45  
**Board:**  
- Prof. Dr./ M. Amin El-Sahir - BUE  
- Assoc.Prof. Dr. / M. Hussein Samour - EAF  
- Lt.Col. Dr. / Mahmoud Abd El-Hafize - MTC

| Session No  | Title                                                                 | Authors                                                                 |
|-------------|----------------------------------------------------------------------|------------------------------------------------------------------------|
| 005-ICEE-10 | Superior spectral performance of decoy flares compositions via inclusion of graphite as a black body emitter | Amr A. Elmotaz¹, Sherif Elbasuney¹, Hesham Tantawy¹, M. A. Sadek²       |
| 006-ICEE-10 | Assessment of antioxidant resistance to thermal- oxidative degradation of stabilized poly-butadiene binder | E.Elsaka, Sh. Elbasuney, A. Elbeih, H.Mostafa, M.E. Awad, T. M. Elhedery |
| 007-ICEE-10 | A study of the detonation wave shape inside confined explosive with a metallic liner | Tamer Elshenawy, Ahmed Elbeih, Mohamed G. Zaki, Ahmed K. Hussein         |
| 008-ICEE-10 | The Potentials of Aluminum Nanoparticles: Novel High Energy Density Material for Underwater Explosions | Sh.Elbasuney, M. Gaber, M.Bennaya, Sh.M. Abdelkhalek, M.Radwan          |
| 009-ICEE-10 | Aluminum Nanoparticles: a Novel High Energy Density Material for Metalized Explosives with Combined Destructive Effect (Combustion/Detonation) | Sherif Elbasuney^ab*, M. Gaber Zaky^a, Mostafa Radwan^a, Ahmed Maraden^a, Hesham Ramzy^a, Sherif M. Abdelkhalek^a, Sherif F. Mostafa^a |
Superior spectral performance of decoy flares compositions via inclusion of graphite as a black body emitter

Amr A. Elmotaz1, Sherif Elbasuney1, Hesham Tantawy1, M. A. Sadek2

Abstract

Graphite particles can offer high interfacial surface area as well as high emissivity as black body; therefore it can find wide application in advanced decoy flares. In the current study graphite particles of 100 μm size, were employed with different reactive metal fuels including Mg, Al, and Mg-Al alloy. Different formulations based on graphite ratio up to 8 wt % were developed via granulation with subsequent pressing. Thermal signature was measured using IR spectrometer (1-6 μm) Arc-Optics. Nanocomposite flare based on Mg-Al fuel, and graphite demonstrated superior spectral intensity; this formulation offered an increase in average intensity by 83 % to reference. In the mean time, nanocomposite flare based on Al and graphite offered the highest relative intensity /g86/g3 /g82/g73/g3 /g19/g17/g25/g17/g3 /g42/g85/g68/g83/g75/g76/g87/g72/g15/g3 /g68/g86/g3 /g68/g81/g3 /g72/g91/g70/g72/g79/g79/g72/g81/g87/g3 /g86/g82/g88/g85/g70/g72/g3 /g82/g73/g3 carbonaceous materials; that can strengthen incandescence emission. Furthermore Mg-Al reactive metal alloy con offer novel synergism as Mg could vaporize at 1000 °C offering efficient combustion process. It can be concluded that tailored flare can be developed according to the required spectral data.

Keywords:
Thermal signature; Infrared missile; Countermeasure; Decoy flare; Pyrotechnics

1 School of Chemical Engineering, Military Technical College, Cairo, Egypt
2 Chemical engineering department,. British University in Egypt (BUE)
Email: amr_elmotaz@hotmail.com
Assessment of antioxidant resistance to thermal-oxidative degradation of stabilized poly-butadiene binder

E. Elsaka, Sh. Elbasuney, A. Elbeih, H. Mostafa, M. E. Awad, T. M. Elhedery

Abstract

Poly-butadiene is the most common polymeric binder for composite solid propellants. This polymer suffers from oxidative degradation reactions on storing with deterioration in mechanical properties. Certain anti-oxidant materials can retard such reaction offering enhanced aging characteristics. In this study, two different primary antioxidants including phenol-based (AO2246) and amine-based (Flexzone 6H) were employed to stabilize polybutadiene polymer. Oxidation induction time (OIT) was evaluated using isothermal DSC. High OIT value means high resistance to oxidative degradation. The impact of anti-oxidant on mechanical properties was evaluated using shore A. Flexzone 6H significantly improved binder oxidative stability with an increase in OIT value by 20 folds with significant decrease in oxidation enthalpy. Flexzone 6H can offer enhanced resistance toward oxidative reactions; as it can act as efficient H atom donor to break down chain degradation reaction. Additionally, the three stabilized aromatic rings can capture free radicals. AO2246 enhanced the binder mechanical characteristics during aging at 80 ºC using Shore A test. In the meantime, AO2246 could enhance the mechanical properties due to its integration into the polymeric matrix due to –OH functional groups. The two anti-oxidants demonstrated controversy effects. Whereas Flexzone 6H offered enhanced resistance to oxidative degradation; AO2246 offered enhanced mechanical properties.

Keywords:
Antioxidants; Thermal-oxidative stability; Ageing; Composite propellants

1School of chemical Engineering, Military Technical College, Cairo, Egypt
A study of the detonation wave shape inside confined explosive with a metallic liner

Tamer Elshenawy¹, Ahmed Elbeih², Mohamed G. Zaki², Ahmed K. Hussein²

Abstract

The behaviour of shock wave inside a shaped charge is so important that the detonation wave nature characterizes (determines) the degree of jet coherency at the liner interface. The detonation wave shape inside the shaped charge depends on the casing thickness, material, the liner material, geometry and the applied wave shaper geometry. In this paper, a series of numerical simulation models were performed to study the incident and reflected waves and to characterize the resulting shock wave front to evaluate its effect on the produced (generated) jet characteristics. The used code was Autodyn 3D based on non-linear dynamic analysis with jetting analysis model. Inert wave shapers (Lead, Aluminum and steel) and active ones (TNT and PETN) behaviour were studied. The liner type used in this study was copper with in which the apex angle of the liner cone was 40°. It was concluded that the wave front shape has an obvious influence on the characteristics of the jet formation and its properties such as mass of jet and velocities of its tip. Also, the bulk sound speed of the liner itself in addition to the collapse characteristics of the liner was discussed in this paper successfully.

Keywords:
Liner, wave shaper, explosive shock wave, jetting, Autodyn code

¹ Technical Research Center, Cairo, Egypt
² Military Technical College, Kobry Elkobbah, Cairo, Egypt
008-ICEE-10

The Potentials of Aluminum Nanoparticles: Novel High Energy Density Material for Underwater Explosions

Sh. Elbasuney a*, M. Gaber b, M. Bennaya c, Sh. M. Abdelkhalek b, M. Radwan d

Abstract

The destructive parameters of underwater explosives (i.e. shock wave energy, maximum pressure, and bubble radius) are limited to explosion heat; that is comparatively low. One approach for enhanced heat output can be accomplished by integrating reactive metal particles (i.e. Aluminium). However, conventional aluminium particles (μm size) would contribute only with combustion gaseous products behind detonation wave front. Underwater, there is no oxygen for such contribution to take place. Furthermore, conventional Al particles could decrease the detonation velocity. So far, full exploitation of aluminium particles in underwater explosions couldn't be achieved. Aluminium nanoparticles would combust more efficiently within detonation wave front, offering smaller critical diameter, high reaction rate, and high heat release rate. Consequently, Al nanoparticles could be ideal high energy density material for underwater explosion. Ship model with positive metacentric height, GMT = 4.7 cm for ship transverse stability, and GML = 19.3 for ship longitudinal stability was designed. Ship model offers large angle stability (heeling angles = 0-70 deg.). 2 g of explosive charge was detonated underneath the developed naval structure. Upon explosion, the acceleration of the naval structure was measured using shock accelerometer VC tri-axial, high frequency, 5000 ground acceleration, Dytran, Inc. While, Al particles (10 μm) offered an increase in mono-hull acceleration by 16% compared to TNT; Al nanoparticles offered an acceleration increase by 49%. This novel finding can be ascribed to the efficient combustion of Al nanoparticles within detonation wave front offering ideal detonation reaction with enhanced destructive effect.

Keywords: Underwater explosion (UNDEX); Metalized explosives; Shock wave.

a Head on nanotechnology research centre, Military technical college, Cairo, Egypt.
b Military Technical College, Cairo, Egypt.
c School of Ships and submarines engineering, Military Technical college, Cairo, Egypt.
d British University in Egypt, Elshorouk City, Cairo, Egypt.
Aluminum Nanoparticles: a Novel High Energy Density Material for Metalized Explosives with Combined Destructive Effect (Combustion/Detonation)

Sherif Elbasuney a,b*, M. Gaber Zaky a, Mostafa Radwan c, Ahmed Maraden a, Hesham Ramzy a, Sherif M. Abdelkhalek d, Sherif F. Mostafa a

Abstract

Even though, reactive metal particles can boost the energy density with an increase in total impulse of explosive materials. Such particles will react behind the detonation wave front with decrease in detonation velocity and brisance (destructive effect). This study reports on the effective development of aluminium nanoparticles of 100 nm particle size. Al nanoparticles offered superior performance compared micron scale particles. Whereas conventional Al particles (10 μm) offered increase shock wave strength of TNT by 17 %, nanoparticles offered an increase in shock wave strength by 48 %. While micron-Al decreased the destructive effect of TNT by -6.5 %; Al nanoparticles offered an increase in destructive effect by 21 %. The main outcome of this study is that Al nanoparticles offered an enhanced detonation velocity 6330 m/s compared with 5650 m/s for TNT It can be concluded that while conventional Al particles could act as desensitizer; Al nanoparticles could act as sensitizer and could combust more effectively within detonation wave front. Additionally Al nanoparticles offered decrease in TNT critical diameter from 40 mm to 20 mm. This study reports on the real development of metalized nanocomposite explosives with superior performance (combustion/detonation).

Keywords:
Metalized explosives; Combustion, Destructive effect; Workability; Brisance; Thermal behavior

* School of Chemical Engineering, Military Technical College, Kobry El Kobba, Cairo, Egypt.
b Head of nanotechnology research centre, Military Technical College, Cairo Egypt.
c British University in Egypt, El-Shrouk City, Cairo, Egypt.
d Head of Engineering and Technology Research Center, Military Technical College, Cairo, Egypt
s_elbasuney@mtc.edu.eg, sherif_basuney2000@yahoo.com, +201112630789
Session No. 3

Water and Waste Water Treatment by Synthetic Polymers and Adsorbents (WWWT)

Room: N  
Date: Wednesday 8-7-2020  
Time: 9:00 – 10:45  
Board:  
Prof. Dr. /Omar El Farouk Cairo Univ.  
Brig. Gen. Prof. Dr. / M. Aboel-Fotoh MTC  
Col.Dr./ M. Mokhtar Kotb MTC

| 010-ICEE-10 | Physico Chemical Studies for water at Rosetta Branch of River Nile, Egypt | Mamdouh S. Masoud\(^{(a)}\), Amel M. Ismail\(^{(a)}\), Hesham M. kamef\(^{(b)}\), Ahmed S. El-Kholany\(^{(a)}\), and Ahmed A.M. ElKasas\(^{(a)}\) |
|-------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 011-ICEE-10 | Rain Transmission Losses Assessment in Arid Environment, Egypt: Numerical and Experimental Study | Adel Bakheet\(^{1}\), Ahmed Sefelnasr\(^{2}\) |
| 012-ICEE-10 | Synthesis and characterization of zinc-imidazolate coordination polymer and its use for photocatalytic degradation of methylene blue dye under visible light irradiation | Mostafa Mohsen\(^{1,2}\), Ibrahim Naeem\(^{1}\), Mohamed I. Awaad\(^{l}\) and Ahmad Baraka\(^{l}\) |
| 013-ICEE-10 | Synthesis, Characterization and application of analcime to control nitrate ions from the ground water samples from Wadi El-Assiuti – Egypt as a low-cost and locally available adsorbent | A.A. Abdelmoneim\(^{1}\), M.Abdul-Moneim\(^{2}\), A.A Geies\(^{2}\), and Seham O. Farghaly\(^{1}\) |
Physico Chemical Studies for water at Rosetta Branch of River Nile, Egypt

Mamdouh S. Masoud(a), Amel M. Ismail(a), Hesham M. kameł(b), Ahmed S. El-Kholany*(b) and Ahmed A.M. ElKasas(a)

Abstract

This work was carried out to study the quality of water of Rosetta branch. Five sites were chosen for sampling during the period of January 2013 to December 2013. Physical parameters (Temperature, electrical conductivity (EC), turbidity and pH) and chemical parameters (concentration of Cl-, Ca2+, Mg2+, NH4+, SO42-, NO2-, and some of trace metals, alkalinity, total hardness, Dissolved Oxygen(DO), Chemical Oxygen Demand(COD) and Biological Oxygen Demand(BOD) were discussed. These results were compared with the results of another study that were carried out at Rosita Branch at 2018. Statistical analysis of data was computed to show the correlation between some parameters through the whole sampling sites during the period of the study, using simple correlation coefficient.

Keywords:
Rosetta branch - Physical and chemical parameters – Water Quality Index - Correlation Coefficients

a) Chemistry Department, Faculty of Science, Alexandria University, Egypt.
b) Medical Laboratory Department, Faculty of Allied Medical Sciences, Pharos University, Alexandria, Egypt
Rain Transmission Losses Assessment in Arid Environment, Egypt: Numerical and Experimental Study

Dr./Adel Bakheet¹, Assoc. Prof. Dr./ Ahmed Sefelnasr², and Mohamed Saber³

Abstract

In water-scarce regions, Transmission Losses Assessment from rainfall is required for the estimation of groundwater recharge. This Study is an attempt to assess Transmission Losses and the infiltration rate at Wadi El-Assiuti, Egypt, field infiltration experiments were conducted to measure the infiltration and porosity at the target area, such as using a double-ring infiltrometer. Quantifying the soil infiltration capacity is very important for determining components of the hydrological modeling, irrigation design and many other natural or man-made processes Steady state infiltration rates have been determined in selected sites of Wadi El-Assiuti. Accurate determination of infiltration rates is essential for reliable prediction of surface runoff and groundwater recharge. Double ring infiltrometer was used to measure infiltration rate at selected sites. An important part of the study was the accurate and consistent measurement of infiltration rates. The infiltration rate was calculated according to the installation and operating instruction for the double ring in ASTM 2003. Final infiltration rates were 18 cm h⁻¹, for the first observation site, 24.2 cm h⁻¹ for the second site and 59 cm h⁻¹ for the third site. The analysis indicated that the soil for the three selected areas is sandy soil. Infiltration rates were taken at 0 to 70 minutes of 10 minutes intervals. The infiltration rate at the third site is high compared to the other two selected sites. After performing the experiments, soil samples have been gathered and analyzed in the laboratory for porosity analysis. The results of this study can therefore be applied in the prediction of saturated hydraulic conductivity of the surface layers and groundwater recharge, and in developing or selecting the most efficient irrigation methods. The results from this work have been also involved in a numerical hydrological model to estimate the Transmission Losses form rainfall at Wadi El-Assiuti using Hydro-BEAM.

Keywords:
Transmission Losses, Double ring in-filtro-meters, hydrological modeling, Wadi El-Assiuti, Hydro-BEAM

¹Ph D. Environmental Geology, water and microbiology lab, Chemistry Administration
¹-Adel Bakheet Mostafa Tel.01007202821 Address- Assiut, bakheet adel@yahoo.com
²Geology Department, Assiut University, ahmed.sefelnasr@science.au.edu.eg
³Senior Researcher, Water Resources Research Center, DPRI, Kyoto University, japan
Synthesis and characterization of zinc-imidazolate coordination polymer and its use for photocatalytic degradation of methylene blue dye under visible light irradiation

Mostafa Mohsen¹, ², Ibrahim Naeem¹, Mohamed I. Awaad¹ and Ahmad Baraka¹

Abstract

Zinc-Imidazole coordination polymer (Zn-Im CP) was facilely synthesized by hydrothermal method from zinc acetate and imidazole as ligand. The structure of the synthesized Zn-Im CP was analyzed by using scanning electron microscopy (SEM), EDX, FTIR, and powder X-ray diffraction (PXRD). Surface area of Zn-Im CP was determined by BET analysis of N₂ adsorption. The photocatalytic performance of Zn-Im CP using visible light irradiation source was investigated using UV–Vis spectrophotometer for the degradation of methylene blue. The pseudo first order reaction kinetic model was applied on the degradation data which gave the rate constant of 0.006 min⁻¹. The results indicate that Zn-Im CP exhibits good photocatalytic performance for the photodegradation of methylene blue following indirect mechanism pathway.

Keywords:
Photocatalytic degradation, Visible light, Coordination polymer, Dye, imidazole

¹ Military Technical College, Kobry El-Kobbah, Cairo, Egypt
² The corresponding author, E-mail Moustafa.klm@gmail.com
Synthesis, Characterization and application of analcime to control nitrate ions from the ground water samples from Wadi El-Assiuti – Egypt as a low-cost and locally available adsorbent

Ahmed A. Abdelmoneim¹, M. Abdul-Moneim², A.A. Geies³, and Seham O. Farghaly¹

Abstract

In this study, the sorption behavior of synthetic (Analcime) zeolites with respect to nitrate ions has been studied in order to consider its application to purify ground water. Analcime or also can be called analcite (from the Greek, means “weak”) is a kind of grey, white or colorless tectosilicates minerals. It is hydrated sodium aluminum silicates which exist in cubic form in crystalline. Analcime was successively synthesized from kaolinite as a raw material using the fusion with NaOH method. The conditions of hydrothermal crystallization (zeolitization) were found to be at temperature of 170°C, and time span between 36 h and 72 h for kaoline with the molar composition of 6Na₂O: 0.75Al₂O₃:30SiO₂: 780H₂O. The synthetic materials have been characterized by X-ray diffraction (XRD), scanning electron microscope (SEM), Fourier transform infrared spectroscopy (FT-IR) and thermo gravimetric (DTA/TGA) analysis. The results indicate that the crystallization of analcime not affected by the hydrothermal reaction time. Also analcime was tested as adsorbents for the removal of nitrate ions from the ground water samples from Wadi El-Assiuti – Egypt. The adsorption capacities of nitrate ions by analcime, as a function of its concentration, were determined at room temperature by varying analcime concentration for each water samples. During the process, all the other parameters (pH and contact time) were kept constant with respect to the initial concentration of nitrate ions in the water samples. It was found analcime has good removal efficiency obtained at pH 6-7.6, adsorbent dosage 10-12 g/L, and contact time 60 min. The Langmuir constants model for NO₃⁻ ion sorption on the adsorption isotherms is fitted well. The R_l value in the present investigation was equal or less than one, indicating that the adsorption of NO₃⁻ ion by analcime is favorable.

Keywords:
Analcime, Ground water, Characterization, Element contents, Water treatment

¹Geology Departments, Faculty of Science, Sohag University, Sohag, Egypt
²Geology Department, ³Chemistry Department, Faculty of
Session No 4

Chemical Engineering Applications (CEA)

| #   | Title                                                                 | Authors                                      |
|-----|----------------------------------------------------------------------|----------------------------------------------|
| 014-ICEE-10 | Ionic Liquids based on Different Chain Fatty Acids as Green Corrosion Inhibitors for C-steel in Produced Oilfield Water | Y Atef* and A Ghanem² |
| 015-ICEE-10 | Thermal and Potentiometric Studies for Complexes of Zr and Hf with Some Barbituric Acid Derivatives | Mamdouh S. Masoud (a), Azza S. Hassan(a), Nermeen M. Desouky(a), Hesham M. kamel(b), Ahmed S. El-Kholany* (b) |
| 016-ICEE-10 | Thermodynamic Analysis for Tracking the Effect of the Egyptian Zirconium Silicate on the slag properties of low hydrogen Welding Electrodes | A.AbdElkarim¹, H.M.Abd El-Aziz², Waleed.A.Mohrez³ and H. Mashaal⁴ |
Ionic Liquids based on Different Chain Fatty Acids as Green Corrosion Inhibitors for C-steel in Produced Oilfield Water

Y Atef* and A Ghanem2

Abstract

The work presents the investigation of fatty acids based ionic liquid as green corrosion inhibitors for C-steel in produced oilfield water. Different-chain length fatty acids C₆, C₁₂ and C₁₈₁ are mixed with di-ethanol amine (DEA) to produce some ionic liquids and evaluated the corrosion rates on C-steel surface using weight loss method and potential time measurements. The prepared ionic solutions were shown to be effective in reducing the corrosion rates as sustainable corrosion inhibitors. The polar unit is considered as the reaction center for the adsorption process. Generally, the inhibition efficiency increases with increase the inhibitors concentration.

Keywords:
Carbon steel, ionic liquids, fatty acids, corrosion inhibitors, adsorption

* Egyptian Chemistry Administration, Cairo, Egypt, E-mail: jasy9@yahoo.com
2 PVT Laboratory, Production Department, Egyptian Petroleum Research Institute (EPRI), Cairo, Egypt
Thermal and Potentiometric Studies for Complexes of Zr and Hf with Some Barbituric Acid Derivatives

Mamdouh S. Masoud (a), Azza S. Hassan(a), Nermeen M. Desouky(a), Hesham M. Kamel(b), Ahmed S. El-Kholany* (b)

Abstract

The complexes of Barbital (Bal), Thiobarbituric acid thione (TBA), Thiobarbituric acid thiol (2-TBA), 2-Thiouracil (TU) with Zr (IV) and Hf (IV) were prepared. The structures and mode of bonding were characterized by elemental analysis, IR and electronic spectroscopy. Thermal analyses of the prepared complexes were done by DTA, TG, DSC techniques. The thermodynamic parameters were evaluated. The change of entropy values, $\Delta S^0$, for all the complexes lay within the range -0.267 to -0.299 KJ K^{-1} mol^{-1}. The thermal processes proceed in complicated mechanisms with ordered transition states. In general, the complexes dissociated after losing small molecules such as H$_2$O, Cl$_2$, and CO. The decomposition is usually ended by the metal moiety. The DSC technique explained the effect of temperature on physical properties of some complexes. The glass transition phase doesn’t appear in all the complexes, while the crystallization temperature (Tc) was 78°C-322.12°C. Potentiometric titration studies calculated the dissociation constants of the ligands, the stability constants of the complexes and the distribution of species at different pH values.

Keywords:
IR, DTA, TGA, DSC, potentiometric titration, complexes, Zr, Hf, barbituric, acid derivatives
Thermodynamic Analysis for Tracking the Effect of the Egyptian Zirconium Silicate on the slag properties of low hydrogen Welding Electrodes

A.AbdElkarim, H.M.Abd El-Aziz, Waleed.A.Mohrez and H. Mashaal

Abstract

One of the most common types of welding electrodes, used in welding processes; are the low hydrogen electrode classification; E 7018. This electrode is applied for fabrication most carbon steel alloys, where it used for welding plate works of ships, equipment, tanks, boilers and pressure vessels, steel structures of buildings, bridges as well. One of the most common drawbacks resulting of using of this welding electrode is the difficulty of removing the slag between the deposited passes, which consumes time and money and hence decreasing the quality of welding process also one of the most drawbacks of this type of welding electrode is the rabid burning of coating flux at elevated amperes increase.

This study aimed to suggest rooted solution for these two problems by adding zirconium silicate to the flux recipe.

Different percentages of Egyptian zirconium silicate were added to the coating flux recipes of type E7018 where the changes at both weldability and slag removing between deposited passes were noticed at different amperes.

By using HSc simulation program of the thermodynamics data and expected phases in slag were studied. Microstructure samples of weld metal were imaged and analyzed, basicity index was calculated, XRF chemical analysis for all slag different samples, were determined. The study concluded that adding 5% of the Egyptian zirconium silicate to the flux clearly improved; the welding properties as well as the ease of slag removal.

Keywords:

1-Nuclear materials Authority, Cairo
2-Mining and petroleum Dep., faculty of Engineering, Al-Azhar University, Cairo
Radiological and environmental studies on the metamorphosed sandstones at Wadi Sikait area, Southeastern Desert, Egypt

A. H. El-Farrash**, M. G. El-Feky*, S. F. Hassan*, S. A. Abu Elatta*, and M. Refaat*
Radiological and environmental studies on the metamorphosed sandstones at Wadi Sikait area, Southeastern Desert, Egypt

A. H. El-Farrash**, M. G. El-Feky*, S. F. Hassan*, Soliman A. Abu Elatta*, and M. Refaat*

Abstract

Wadi Sikait area lies in the southern part of the Eastern Desert of Egypt along the upper stream of Wadi Sikait. The exposed rock units in Wadi Sikait area are ophiolitic mélangé rocks, metamorphosed sandstones, and porphyritic granites, lamprophyre dykes, in addition to fluorite and quartz veins. The activity concentrations of various radionuclides are measured by NaI-Tl activated detector and the radioactive mineralization were determined by Alpha track technique using CR-39 films. Radiometric investigations indicate that 238U activity concentrations range between 37.2 and 520.4 with average 148.8 BqKg-1, 232Th activity concentrations vary between 8.08 and 366.99 BqKg-1 with 76.75 BqKg-1 as an average. The studied metamorphosed sandstones have higher values relative the world concentration levels. High uranium content of the metamorphosed sandstone is attributed to presence radioactive minerals like uranophane and autunite, in addition to accessory minerals like allanite, zircon and monazite. Other U-bearing minerals are also recorded as biotite, muscovite, iron oxides and clays. Absorbed Dose Rate (D), annual effective dose equivalent (AEDE), radium equivalent activity (Raeq), external (Hex) and internal (Hin) hazard index, in addition to activity gamma index (Iy) caused by gamma emitting natural radionuclide are determined from the obtained values of 226Ra, 232Th and 40K. Fairly, many of the studied metamorphosed sandstone do not satisfy the universal standards.

Keywords:
Radiological, Environment, Uranium, Thorium, Egypt

Nuclear materials Authority, Cairo
Session No 6

Nuclear and Radiometric Applications (NRA)

Room: N
Date: Thursday, 9/7/2020
Time: 9:00 – 10:45
Board:
Prof. Dr. / Amr M.I. Kany Al Azhar Univ.
Prof. Dr. / Magdy Senna AEA
Col. Assoc.Prof. Dr. / Mohamed Abd El Rahman MTC

| Session Code | Title |
|--------------|-------|
| 018-ICEE-10  | Mineralogical and Radiometric Studies of Granitic Rocks in Wadi Sabbaghi Area, South Sinai, Egypt |
| 019-ICEE-10  | Sub-channel thermal-hydraulic analysis for VVER- 1000 generation III PWR |
| 020-ICEE-10  | Effect of The Formation Parameters on The Thermal Properties of La2Zr2O7 |

Mira, H. I.2, El-Gharbawy, R.I.1, Elmowafy, A.A.2, Osman, A.F.1 El Maadawy, W.M.2
Alsherief M Almessallmy2, Mohamed K Shaat2 and Saeed A Hassanien1
Ahmed Abdelkareem
Mineralogical and Radiometric Studies of Granitic Rocks in Wadi Sabbagh Area, South Sinai, Egypt

Mira, H. I.2., El-Gharbawy, R.I.1, Elmowafy, A.A.2, Osman, A.F.1 El Maadawy, W.M.2

Abstract

Wadi Sabbagh area is located at southern part of Sinai Peninsula. It is constrained by Latitudes 28° 05´ and 28° 15´ N and Longitudes 34° 00´ and 34° 15´ E. Gneisses, migmatites, metasediments, syn- and post-orogenic granites in addition to pegmatites and post-granitic dykes are the main rock units encountered in this area. Geological, petrological and geochemical studies indicate that there are two distinct suites of granitoids: older tonalite to granodiorite assemblage and younger two phases (monzo- to syenogranites and alkaline granites). The field radiometric survey and lab investigations indicates that, the anomalous uranium contents are mainly restricted to the pegmatites and altered monzogranites. The eU contents of pegmatites reach up to 168 ppm with 117 ppm in the average, while the eTh reach up to 257 ppm with 175 ppm in the average. The eTh/eU ratios range from 1.1 to 2.4 with an average 1.6. In the altered monzogranites, eU reaches up to 305 ppm with an average of 126 ppm. The eTh reaches up to 382 ppm with an average of 166 ppm. The average values of Ra and K are 60 ppm and 2.93 wt percentage, respectively. The average values eTh/eU ratios in the examined anomalies monzogranite (1.56) indicating addition of uranium. The high eU and eTh contents may be attributed to the secondary ascending hydrothermal solutions that lead to the accumulation of radioactive mineralizations mostly along fractures, faults and shear districts. The recognized radioactive minerals in the studied pegmatites are thorite, uranothorite, zircon, fluorite, columbite, samarskite, monazite, xenotime and allanite, whereas thorite, uranothorite, zircon and fluorite are the foremost radioactive minerals in the altered younger granites. Additional accessory minerals such as ilmenite, magnetite, hematite, pyrite and rutile were found in the studied pegmatites. Hematite, magnetite and pyrite are the foremost accessories accompanying the radioactive minerals in the altered younger granites.

Keywords:
Sabbagh, alkaline granite, monzogranite, pegmatite, dykes, radioactive, hydrothermal solutions

1 Geology Department, Faculty of Science, Ain Shams University, Egypt.
2 Research Department, Nuclear Materials Authority, Cairo, Egypt
Sub-channel thermal-hydraulic analysis for VVER-1000 generation III PWR

Alsherief M. Almessallmy\textsuperscript{1}, Mohamed K Shaat\textsuperscript{2} and Saeed A Hassanien\textsuperscript{1}

Abstract

The sub-channel thermal-hydraulic analysis of a nuclear reactor is essential for assessing of its safety aspects. In this paper, the VVER-1000 has been selected as an example of the third generation reactors since it meets most of the international safety standards and because it has been taken as a base for designing the VVER-1200 which is belonging to the III+ generation. A steady state mathematical model has been proposed and solved to validate and assure that the hottest channel temperature limits are satisfied. The various temperature distributions, the critical heat flux and the departure from nucleate boiling ratio (DNBR) for the hottest channel were evaluated. Also, a transient state model has also been presented and solved using the finite difference method with the aid of MATLAB algorithm. An exponential loss of flow rate of the reactor core coolant was triggered from the steady state conditions. We assumed that the neutron flux and the generated power were unchanged during the postulated event. The average core coolant flow time constant was treated as a single parameter expressing the rapidity of the event. A value of 250 seconds time constant was assumed for slow transient, whereas 10 seconds was assumed for fast one. The reactor core was assumed to be protected through the reactor control system and mitigated according to the regular emergency operating procedures. The time dependent temperature distributions were calculated for the cladding of the hottest coolant channel. For each value of the temperature, the response time required for reaching unsafe conditions was evaluated, discussed and presented.

Keywords:
Thermal-hydraulics, steady-state, transient state, hottest channel, MATLAB, DNBR, loss of flow, time constant, postulated event

\textsuperscript{1}Egyptian Armed Forces, Cairo, Egypt, Email: shomedhat@gmail.com
\textsuperscript{2}Egyptian Atomic Energy Authority, Cairo, Egypt
Effect of the Formation Parameters on the Thermal Properties of La$_2$Zr$_2$O$_7$

Ahmed Abdelkareem

Abstract

Lanthanum zirconates has been suggested as a thermal barrier coating for many high temperature applications. This study is focusing on the effect of different preparation parameters on the thermal conductivity of La$_2$Zr$_2$O$_7$. We have used solid state reaction to form the zirconates powder was very good homogeneity. We have studied the effect of the intimal ZrO$_2$/La$_2$O$_3$ ratio, and found the 50% to be the optimum. The effect of the sintering temperature has also been studied and 1100°C was chosen as the optimum sintering temperature. The sintering time was also studied, where 3 hours was proved to be enough to obtain a homogeneous single phase compound with affordable method.

Keywords:
Ceramic composites, Sintering, Thermal properties, Thermodynamics and kinetics of processes in materials

*Nuclear Materials Authority, POBox 540 Madi, Cairo
### Session No 7

**Extraction Techniques of Nuclear Materials**

**Room:** N  
**Date:** Thursday, 9/7/2020  
**Time:** 11:00-12:45  
**Board:**  
- Prof. Dr. / Hamid Mira  
- Prof. Dr. / Gamal Othman  
- Col. Dr. / Ahmed Farghal Tawfik  
- NMA  
- NRC  
- MTC

| 021-ICEE-10 | Bioleaching of uranium from El-Sella ore material using Epicoccum nigrum |
|-------------|-------------------------------------------------------------------------|
|             | Azhar M. Elsayad1, *Shimaa S. Hussien2, Mohamed G. Mahfouz2, Abdo A. El Mougith1 and Wesam A. Hassanien1 |

| 022-ICEE-10 | Commercial approach for highly pure thorium from Egyptian monazite mineral acid process |
|-------------|----------------------------------------------------------------------------------------|
|             | Abd El Fatah A.I.L                                                                       |

| 023-ICEE-10 | Biosorption OF Uranium BY Saragassum Detifolium from the Trachytic Sills OF Wadi-El Atshan Area, Central Eastern Desert, Egypt |
|-------------|-----------------------------------------------------------------------------------------------------------------------------|
|             | Nagdi M. Farag and Nora . SH .Gad                                                                                           |
Bioleaching of uranium from El-Sella ore material using 
Epicoccum nigrum

Azhar M. Elsayad1, *Shimaa S. Hussien2, Mohamed G. Mahfouz2, Abdo A. El Mougith1 and 
Wesam A. Hassanien1

Abstract

Uranium (U) is one of the strategic elements and essential for many applications as a fuel in nuclear power plants and nuclear weapons. Bioleaching of uranium was carried out with Epicoccum nigrum isolated from El-Sella ore material. El-Sella area is located in the southern eastern desert of Egypt. The maximum bioleaching of U(VI) was found to be 76.6 % at these optimum conditions: 9 days incubation period, 0.5% pulp density, 30 °C incubation temperature at shaking speed 175 rpm. Glucose and NH4Cl were considered the optimum carbon and nitrogen sources for fungal growth. E. nigrum exhibit good potential in generating varieties of organic acids which effective for bioleaching of uranium. It produced 112.3 and 23.5 μg/ml from gallic and ellagic acids in the culture filtrate under the optimum conditions. This work addresses the area of beneficiation of the used mineral to solubilize U(VI) through the biotechnological route in Egypt, where the bioleaching method is more effective than the chemical one using organic acids.

Keywords:
Bioleaching; uranium; organic acids; Epicoccumnigrum

1Department of Botany, Faculty of Science, Zagazig University, Egypt
2Nuclear Materials Authority, P.O. Box 530 El-Maadi, Cairo, Egypt
Abstract

Thorium has a special interest in the future nuclear energy as a fuel especially the breeder reactors. The present research has been fulfilled throughout successive research schedule manner on separation and purification of thorium from Egyptian beach monazite mineral acid digtion. Monazite mineral was digested with sulfuric acid and dissolute with ice water, the clear solution precipitated to produce thorium pyrophosphate with 45% purity. The purification was carried out after the caustafication and leaching with hydrochloric acid with the addition of oxalic acid at pH 0.3-0.4 to produce 91.68 % purity of thorium oxalate. The high purification is done with the uses of thiosulphate salt to produce 99% purity.

Keywords:
Monazite mineral, thorium separation and production, sodium thiosulfate
Biosorption OF Uranium BY Saragassum Detifolium from the Trachytic Sills OF Wadi-El Atshan Area, Central Eastern Desert, Egypt

Nagdi M. Farag and Nora . SH .Gad

Abstract

In wadi El Atshan area, Central Eastern Desert of Egypt, the main rock types exposed in that area are the older granites, Hammamat sedimentary rocks, younger granites, trachytic sills and dikes. The Field studies and radiometric survey indicate that the trachytic sills are the main rock type in the investigated area which contain secondary uranium minerals. Sargassum detifolium is used to capture uranium from the trachytic sills. The analysis indicate that this algae absorb the uranium content by 100% in two samples where happened in the other samples as well as, it change the chemical composition of some minerals content, while some elements changed while other elements are decreased, Sargassum detifolium has the ability to biosorbe uranium content about 75% as in uranotile mineral \( \text{CaU}_2(\text{SiO}_4)_2(\text{OH})_6.3\text{H}_2\text{O} \).

Keywords:
Sargassum detifolium, trachytic rocks,

Nuclear Materials Authority, Cairo, Egypt, norashenouda@yahoo.com