

### **Cu<sup>2+</sup> and Pb<sup>2+</sup> removal by chemically modified silical gel with amidoxime**

Eddy M.F.M. Yusslee<sup>1</sup>, M.R. Lutfor<sup>2</sup>, Sazmal E. Arshad<sup>3</sup>

<sup>1</sup>Preparatory Centre for Science and Technology, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

<sup>2</sup>Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia

<sup>3</sup>Faculty of Science and Natural Resources, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

Corresponding author: <sup>1</sup>[eddy@ums.edu.my](mailto:eddy@ums.edu.my); <sup>2</sup>[lutfor@ump.edu.my](mailto:lutfor@ump.edu.my); <sup>3</sup>[sazmal@ums.edu.my](mailto:sazmal@ums.edu.my)

Chemically modified silica gel with amidoxime group was synthesized by silanization with 3-aminopropyltriethoxysilane (APTES) followed by addition of acrylonitrile (AN) monomer to produce acrylonitrile modified silica (ANSiO<sub>2</sub>). The product undergoes amidoximation reaction after been treated with alkaline hydroxylamine hydrochloride solution to produce amidoxime modified silica (Ami-SiO<sub>2</sub>). The final product was used as an adsorbent for copper(II) and lead(II) metal ions removal. All the structures of adsorbent and intermediate were characterized by FT-IR, SEM and elemental analysis to justify the presence of organic groups during and after modification. The optimum conditions for the removal of both metals at an initial concentration of 50 mg/L were 2 g/L of dose, pH6 and 2 hours of contact time. The removal of Cu<sup>2+</sup> and Pb<sup>2+</sup> by Ami-SiO<sub>2</sub> was substantially higher compared to its unmodified form. A significant binding property of metal ions by the adsorbent at the optimum conditions was observed and the maximum adsorption capacities for Cu<sup>2+</sup> and Pb<sup>2+</sup> were 24.88 mg/g and 23.87 mg/g, respectively. The sorption capacities of metal ions by Ami-SiO<sub>2</sub> were pH-dependent, and the selectivity of the adsorbent towards Cu<sup>2+</sup> was higher compared to Pb<sup>2+</sup>. The rate of exchange was rapid, which was t<sub>1/2</sub> < 10 min for both of Cu<sup>2+</sup> and Pb<sup>2+</sup>.

Keywords: Silica gel, silanization, acrylonitrile, amidoxime, adsorption.

### **Synthesis Of Chemically Modified Silica Gel With Amidoxime And Its Adsorption Performance For The Removal Of Copper(II) And Lead(II) From Aqueous Phase**

<sup>1\*</sup>Eddy M.F.M. Yusslee, <sup>2</sup>M.R. Lutfor, <sup>3</sup>N.H. Dahon, <sup>4</sup>Sazmal E. Arshad

<sup>1,3</sup>Preparatory Centre for Science and Technology, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia. <sup>2</sup>Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia. <sup>4</sup>Faculty of Science and Natural Resources, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

\*Corresponding author: [eddy@ums.edu.my](mailto:eddy@ums.edu.my)

Chemically modified silica gel with amidoxime groups was synthesized by silanization with 3-aminopropyltriethoxysilane (APTES) followed by addition of acrylonitrile (AN) monomer to produce acrylonitrile modified silica (AN-SiO<sub>2</sub>). The product undergoes amidoximation reaction after been treated with alkaline hydroxylamine hydrochloride solution to produce amidoxime modified silica (Ami-SiO<sub>2</sub>). The final product was used as an adsorbent for copper(II) and lead(II) metal ions removal. All the structures of adsorbent and intermediate were characterized by FT-IR, SEM and elemental analysis to justify the presence of organic groups during and after modification. The optimum conditions for the removal of both metals at an initial concentration of 50 mg/L were at pH6 and 2 hours of contact time. The removal of Cu<sup>2+</sup> and Pb<sup>2+</sup> by Ami-SiO<sub>2</sub> was substantially higher compared to its unmodified form. The sorption capacities of metal ions by Ami-SiO<sub>2</sub> were pH-dependent, and the selectivity of the adsorbent towards Cu<sup>2+</sup> was higher compared to Pb<sup>2+</sup>. The rate of exchange was rapid, which was t<sub>1/2</sub> < 10 min for both of Cu<sup>2+</sup> and Pb<sup>2+</sup>.

Keywords: Silica gel Silanization Acrylonitrile Amidoxime Adsorption

the sorption/desorption process up to ten cycles without any significant loss in its original sensing and removal performances.

Keywords: Adsorption, Khaya cellulose, Poly(hydroxamic acid), Transition metals, Extraction

Synthesis of tapioca cellulose-based poly(hydroxamic acid) ligand for heavy metals removal from water

*Md. Lutfor Rahman<sup>a\*</sup>, Hira Bablu Mandal<sup>a</sup>, Shaheen M. Sarkar<sup>a</sup>, M. Nomani Kabir<sup>b</sup>, Eddy M. Farid<sup>c</sup>, Sazmal E. Arshad<sup>c</sup> and Baba Musta<sup>c</sup>*

<sup>a</sup> Faculty of Industrial Sciences and Technology, University Malaysia Pahang, Pahang, Malaysia;

<sup>b</sup> Faculty of Computer Systems and Software, Engineering, University Malaysia Pahang, Pahang, Malaysia;

<sup>c</sup> Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia

\*Corresponding author: Md Lutfor Rahman, E-mail: [lutfor73@gmail.com](mailto:lutfor73@gmail.com)

A graft copolymerization was performed using free radical initiating process to prepare the poly(methyl acrylate) grafted copolymer from the tapioca cellulose. The desired material is poly(hydroxamic acid) ligand, which is synthesized from poly(methyl acrylate) grafted cellulose using hydroximation reaction. The tapioca cellulose, grafted cellulose and poly(hydroxamic acid) ligand were characterized by Infrared Spectroscopy and Field Emission Scanning Electron Microscope. The adsorption capacity with copper was found to be good, 210 mg g<sup>-1</sup> with a faster adsorption rate (t<sub>1/2</sub> D 10.5 min). The adsorption capacities for other heavy metal ions were also found to be strong such as Fe<sup>3+</sup>, Cr<sup>3+</sup>, Co<sup>3+</sup> and Ni<sup>2+</sup> were 191, 182, 202 and 173 mg g<sup>-1</sup>, respectively at pH 6. To predict the adsorption behavior, the heavy metal ions sorption onto ligand were well-fitted with the Langmuir isotherm model (R<sup>2</sup> > 0.99), which suggest that the cellulose-based adsorbent i.e., poly(hydroxamic acid) ligand surface is homogenous and monolayer. The reusability was checked by the sorption/desorption process for six cycles and the sorption and extraction efficiency in each cycle was determined. This new adsorbent can be reused in many cycles without any significant loss in its original removal performances.

Keywords: Tapioca cellulose; poly (hydroxamic acid) ligand; heavy metals; adsorption

Nur Hazwani Dahon

2015

### Synthesis Of Chemically Modified Silica Gel With Amidoxime And Its Adsorption Performance For The Removal Of Copper(II) And Lead(II) From Aqueous Phase

<sup>1</sup>Eddy M.F.M. Yusslee, <sup>2</sup>M.R. Lutfor, <sup>3</sup>N.H. Dahon, <sup>4</sup>Sazmal E. Arshad

<sup>1,3</sup>Preparatory Centre for Science and Technology, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

<sup>2</sup>Faculty of Industrial Sciences and Technology, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia.

<sup>4</sup>Faculty of Science and Natural Resources, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

\*Corresponding author: Eddy M.F.M. Yusslee, E-mail: [eddy@ums.edu.my](mailto:eddy@ums.edu.my)

Chemically modified silica gel with amidoxime groups was synthesized by silanization with 3-aminopropyltriethoxysilane (APTES) followed by addition of acrylonitrile (AN) monomer to produce acrylonitrile modified silica (AN-SiO<sub>2</sub>). The product undergoes amidoximation reaction after been treated with alkaline hydroxylamine hydrochloride solution to produce amidoxime modified silica (Ami-SiO<sub>2</sub>). The final product was used as an adsorbent for copper(II) and lead(II) metal ions removal. All the structures of adsorbent and intermediate were characterized by FT-IR, SEM and elemental analysis to justify the presence of organic groups during and after modification. The optimum conditions for the removal of both metals at an initial concentration of 50 mg/L were at pH6 and 2 hours of contact time. The removal of Cu<sup>2+</sup> and Pb<sup>2+</sup> by Ami-SiO<sub>2</sub> was substantially higher compared to its unmodified form. The sorption capacities of metal ions by Ami-SiO<sub>2</sub> were pH-dependent, and the selectivity of the adsorbent towards Cu<sup>2+</sup> was higher compared to Pb<sup>2+</sup>. The rate of exchange was rapid, which was  $t_{1/2} < 10$  min for both of Cu<sup>2+</sup> and Pb<sup>2+</sup>.

Keywords: Silica gel; Silanization Acrylonitrile; Amidoxime Adsorption

Elnetthra Folly Eldy

2015

### Integrated problem-based learning approach in physics courses: a case study of students' achievement

<sup>1</sup>FAUZIAH, S., <sup>2</sup>ELNETTHRA, F. E., & <sup>1</sup>JEDOL, D.

<sup>1</sup>Physics with Electronic Programme, Faculty of Science and Natural Resources Universiti Malaysia Sabah (UMS) UMS Road, 88400 Kota Kinabalu Sabah

<sup>2</sup>Preparatory Centre for Science & Technology Universiti Malaysia Sabah (UMS) UMS Road, 88400 Kota Kinabalu Sabah

Corresponding author: E-

mail: [follyelnetthra@yahoo.com](mailto:follyelnetthra@yahoo.com); [fauziahs@ums.edu.my](mailto:fauziahs@ums.edu.my); [fauziahsulaiman6@gmail.com](mailto:fauziahsulaiman6@gmail.com); [jed@ums.edu.my](mailto:jed@ums.edu.my); [jedolums@gmail.com](mailto:jedolums@gmail.com)

The study was sets out to monitor students' achievement when exposed with two different approaches. The approaches that used were problem-based learning assessment (PBLa) and Conventional assessment (Ca). The study was carried out in Faculty of Science and Natural Resources, Universiti Malaysia Sabah involving students who registered under Physics with Electronic Programme. The main objective of this paper is to scrutiny on how PBLa and Ca might contribute to students' performance that leads to their final grade in total. Two physics courses (i.e., Waves and Optic (SF10603) and Thermodynamics (SF20503)) were chosen. Data was gathered from three (3) sequential different

batches of students who registered for the courses. The courses were offered in every first (1st) and second (2nd) semester in each session (i.e., 2012/2013(N=28); 2013/2014 (N=57); and 2014/2015 (N=47)). In the first semester students were exposed with a course with mixed approach of PBLa and CBLa. The different of students' achievement between the two were gathered. As in the second semester, same students were undergone with the same PBLa assessment for the second course and the data was gathered in. From the data analysis, the different and the pattern outcome between these two semesters will be generalised. As a conclusion though in first semester some of students get higher CBLa marks as compare to PBLa (yet majority of students stated higher mark favour to PBLa), nevertheless they still maintain good grade as in the second semester as where the assessment were undergone PBLa totally. This paper also discussed type of assessments that carried out in PBLa and conventional approach.

Keywords: Problem-based learning assessment; Conventional assessment

### **Problem-based learning (pbl) assessment vs. Conventional assessment in a physics course: a preliminary finding**

<sup>1</sup>FAUZIAH, S., <sup>1</sup>JEDOL, D. & <sup>2</sup>ELNETTHRA, F. E

<sup>1</sup>Physics with Electronic Programme, Faculty of Science and Natural Resources Universiti Malaysia Sabah (UMS) UMS Road, 88400 Kota Kinabalu Sabah

<sup>2</sup>Preparatory Centre for Science & Technology Universiti Malaysia Sabah (UMS) UMS Road, 88400 Kota Kinabalu Sabah

Corresponding author: E-

mail: [follyelnetthra@yahoo.com](mailto:follyelnetthra@yahoo.com); [fauziahs@ums.edu.my](mailto:fauziahs@ums.edu.my); [fauziahsulaiman6@gmail.com](mailto:fauziahsulaiman6@gmail.com); [jed@ums.edu.my](mailto:jed@ums.edu.my); [jedolums@gmail.com](mailto:jedolums@gmail.com)

The study is essentially an exploratory analysis, which sets out to obtain pattern of Problem-Based Learning assessment (PBLa) and Conventional assessment (Ca) that has been carried out in Faculty of Science and Natural Resources, Universiti Malaysia Sabah. The main objective of this paper is to scrutiny on how PBLa and Ca might contribute to students' performance that leads to their final grade in total. A physics course (Waves and Optic, SF10603) has been chosen since it involved two lectures that thought the course for seven weeks each. Data was gathered from three (3) consecutive different batches of students who registered for the course. The course is offer in every second semester in each session (i.e., 2011/2012 (n=34); 2012/2013 (n=60); and 2013/2014 (n=54)). For the first seven weeks student has been exposed with PBLa approach where it is one of the students-centered learning method. The second part of the seven weeks, another lecturer took over. Students were undergone Ca of teaching and learning activities since then. The data analysis carried out a pattern where PBLa approach showed a positive consistency in students' achievement compare to its counterparts. This paper also discussed type of assessments that carried out in PBLa and conventional approach.

Keywords: Problem-based learning assessment; Conventional assessment.

### **E-learning in physics courses: a preliminary of students' acceptance**

<sup>1</sup>FAUZIAH, S., & <sup>2</sup>ELNETTHRA, F. E.

<sup>1</sup>Physics with Electronic Programme, Faculty of Science and Natural Resources Universiti Malaysia Sabah (UMS) UMS Road, 88400 Kota Kinabalu Sabah

<sup>2</sup>Preparatory Centre for Science & Technology Universiti Malaysia Sabah (UMS) UMS Road, 88400 Kota Kinabalu Sabah

Corresponding author: E-

mail: [follyelnetthra@yahoo.com](mailto:follyelnetthra@yahoo.com); [elnetthra@ums.edu.my](mailto:elnetthra@ums.edu.my); [fauziahs@ums.edu.my](mailto:fauziahs@ums.edu.my); [fauziahsulaiman6@gmail.com](mailto:fauziahsulaiman6@gmail.com)

This paper explored on readiness and level of acceptance and perceptions towards e-learning among Physics students of Physics with Electronic Programme of University Malaysia Sabah. A constructive approach (i.e., Problem-Based

Learning (PBL) was implemented using an e-learning as its main medium of teaching and learning (T&L). Two (2) physics subjects were involved (i.e., Thermodynamics Physics and Statistical Physics) which were offered on Semester 1 and Semester 2 respectively which took twenty eight (28) weeks durations. During the class, teaching and learning activities were done via e-learning including some of their assessment (i.e., online discussion, forum, uploading and downloading files, etc.). A set of questionnaire was distributed to twenty five (25) second year students before and after e-learning was implemented. Students' response towards e-learning also enclosed in this paper.

Keywords: e-Learning, students' acceptance

**Jackson Chang Hian Wui**

**2015**

### **Physical Computations And Parametric Study Of Ocean Salinity And Temperature Energy Conversion (Ostec)**

*<sup>1</sup>Fuei Pien Chee, <sup>2</sup>Jackson HW Chang, <sup>1</sup>Shu Kim Lee, <sup>1</sup>Awang Sufiyan Abd. Hamid, <sup>1\*</sup>Jedol Dayou*

<sup>1</sup>Energy, Vibration and Sound Research Group (e-VIBS), Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Malaysia.

<sup>2</sup>Preparatory Center for Science and Technology, Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Malaysia.

\*Corresponding Author: Tel: +60-88320000; Fax: +60-88435324; E-mail: [jed@ums.edu.my](mailto:jed@ums.edu.my).

Background: Oceanic salinity and temperature gradient power is an often-overlooked renewable energy. It uses the salinity and temperature difference between incoming freshwater and ocean seawater to generate energy through the use of turbine generator. Recently, a new system named Ocean Salinity and Temperature Energy Conversion (OSTEC) is developed in UMS, Sabah to harvest energy based on this concept. Objective: In this paper, a computational GUI model is developed using MATLAB to predict the expected power output of the system for varying effects of downtube and uptube diameter, height of reservoir, rection temperature, and salinity. Results: The theoretical formulation using kinematic viscosity model as actual imitation to the OSTEC system has proven its feasibility in this work. Comparison between the predicted power output and experimental results confirm the model performance for varying effects studied. Conclusion: With good knowledge of the input parameters, the model could help to quantify the possible change on the expected power output for varying effects and counter react for optimization in real prototype.

Keywords: Salinity; temperature; ocean energy; computational model; GUI; MATLAB

### **Proposed Wound Healing Assessment using Digital Image Analysis**

*<sup>1</sup>Jackson HW Chang, <sup>2</sup>Mun Yee Teh, <sup>2</sup>Jedol Dayou, <sup>2\*</sup>Fuei Pien Chee*

<sup>1</sup>Preparatory Center for Science and Technology, Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Malaysia.

<sup>2</sup>Energy, Vibration and Sound Research Group (e-VIBS), Faculty of Science and Natural Resources, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Malaysia.

\*Corresponding Author: Fuei Pien Chee. (+06) 088-320000x5652; E-mail: [fpchee06@ums.edu.my](mailto:fpchee06@ums.edu.my).

Background: Wound healing is an important, yet complicated process in dermatology. Periodic assessment of wound healing is sometime neglected by the patients due to several factors such as time consuming, high treatment cost and inconvenience. Therefore, improper management on treatment of chronic wounds has always been a significant healthcare issue. Objective: The assessment of wound closure can be performed either by subjective clinical inspection or with a variety of methodologies anticipated to provide more objective data. The aim of this study is to design a convenient and affordable wound scanning system which provides objective and quantitative method to access the degree of wound healing. Results: This system is based on digital image analysis which can measure the shift from black or yellow necrosis to red granulation tissue and also the reduction in wound size. The data on progress of wound healing is clearly presented in both graph and pie chart while all the wound data would be stored automatically for future reference. Conclusion: This system provides a simple solution for monitoring wound healing process which can be used to access the healing trajectory and recommend continued or modified treatment. It also helps to enhance the communication between the patient and clinician on the assessment of wound healing process.

Keywords: Wound healing; image processing; digital image analysis

### Che Haziqah Che Hussin

2015

#### CFEA-Technique: Smaller Size of the Compressed Plaintext

<sup>1</sup>Arif Mandangan, <sup>2</sup>Loh Chai Mei, <sup>3</sup>Chang Ee Hung and <sup>4</sup>Che Haziqah Che Hussin

<sup>1,2,3</sup>School of Science and Technology, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu Sabah Malaysia,

<sup>4</sup>Preparatory Centre for Science and Technology, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu Sabah Malaysia.

Corresponding

author: <sup>1</sup>[arifman@ums.edu.my](mailto:arifman@ums.edu.my), <sup>2</sup>[christineloh\\_90@hotmail.com](mailto:christineloh_90@hotmail.com), <sup>3</sup>[fancy\\_2309@hotmail.com](mailto:fancy_2309@hotmail.com), <sup>4</sup>haziqah@ums.edu.my

Key distribution problem has been solve by the emergence of asymmetric cryptography. Without exchanging private key, two parties are able to communicate securely via insecure channel. As a tradeoff, the efficiency of asymmetric cryptosystems are much slower since the size of the numbers implemented are large in order to provide a good level of security. Since that, efficiency enhancement become one of the most conducted research in cryptography. We proposed a technique that we named as CFEA-technique which aims to reduce the number of plaintext and ciphertext to be encrypted and decrypted by asymmetric cryptosystems. By applying this technique, we the number of plaintext can be reduced from plaintext, where and , to only 2 plaintext. Hence, instead of encrypting plaintext, now we need to encrypt only 2 compressed plaintext. Since the number of plaintext to be encrypted have been reduce, the number of ciphertext to be decrypted also become lesser. Unfortunately, even though the number of plaintext have been reduced to only 2 plaintext, the size of these compressed plaintext are become larger for large . This problem will minimize the efficiency enhancement in encryption and decryption procedures. In this paper, we embed a method into the CFEA-technique in order to produce a new pair of plaintext with smaller sizes.

Keywords: RSA cryptosystem, compression, continued fraction, Euclidean algorithm