UNIVERSITI PENDIDIKAN SULTAN IDRIS

اونيۏرسيتي قندديقن سلطان ادريس

SULTAN IDRIS EDUCATION UNIVERSITY

# Sijil Penyertaan

*Certificate of Participation Awarded to*

**JASLIN IKHSAN**

*For the Attendance of*

**THE INTERNATIONAL POST GRADUATE CONFERENCE ON SCIENCE AND MATHEMATICS 2013**

*On*

**5-6th OCTOBER 2013**

*Venue*

**CONVENTION HALL, E-LEARNING BUILDING**

**UNIVERSITI PENDIDIKAN SULTAN IDRIS**

*Professor Dr. Mustaffa Ahmad*
*Dean*
*Faculty of Science and Mathematics*
*Universiti Pendidikan Sultan Idris*

## Scientific Programme

### Room 1 (Chemistry)

| Session 1 | |
|---|---|
| **Chairperson: Dr.Eli Rohaeti** | |
| Time | Presenter |
| 10.15-10.30 | **OR-001:** Synthesis of Dual Herbicides-Intercalated Layered Double Hydroxide Nanohybrid |
| 10.30-10.45 | **OR-002:** Direct Determination Of Trace Concentration Of Lead In Fresh Water Samples By Adsorptive Cathodic Stripping Voltammetry Of A Lead-Citrate Complex |
| 10.45-11.00 | **Or-003:** Application Of *N,N'*-Bis[2-Hydroxyacetophenone] Ethylenediamine For Electrochemical Detection Of Transition Metal Cadmium, Copper, Lead And Zinc Ions |
| 11.00-11.15 | **OR-004:** Synthesis of Multifunctional Porphyrins *via* Condensation Reaction |
| 11.15-11.30 | **OR-005:** Structure-Antioxidant Activities Relationship Analysis Of Benzalacetone's Derivatives |
| 11.30-11.45 | **OR-006:** Aporphine Alkaloids From Leaves Of Alseodaphne Peduncularis |
| 11.45-12.00 | **OR-007:** Voltammetric Measurement Of Copper(Ii) Using Zinc Layered Hydroxide-2(3-Chlorophenoxy) Propionate Nanocomposite Modified Multiwalled Carbon Nanotube Composite Paste Electrode |
| 12.00-12.15 | **OR-008:** Eggshell, Coconut Tree Sawdust, And Sugarcane Bagasse As Low-Cost Adsorbents For Cu(Ii) Removal From Aqueous Solution |
| 12.15-12.30 | **OR-009:**Adsorption Of Pb(Ii) From Aqueous Solutions Using Durian Tree Sawdust, Oil Palm Empty Fruit Bunch And Coconut Coir |
| 12.30-12.45 | **OR-010:** Surface Complexation Model Of The Sorption Of Phosphate Ions By Montmorillonite |
| Lunch | |
| **Session 2** | |
| **Chairperson: En. Sheikh Ahmad Izaddin Sheikh Mohd Ghazali** | |
| 14.00-14.15 | **OR-011:** The Effect Of Unsaturated Fatty Acids On The Size And Encapsulation Efficiency Of Nanostructured Lipid Carrier (NLC) |
| 14.15-14.30 | **OR-012:** Factorial Analysis on the Migration of Bisphenol A from Polycarbonate Baby Bottles via Modified European Standard Method |
| 14.30-14.45 | **OR-013:** Indole Alkaloids From The Roots Of *Kopsia Singapurensis* Ridl. (Apocynaceae) |
| 14.45-15.00 | **OR-014:** Determination of Toxic Heavy Metals in Herbal Medicines of Malaysian Market- A Preliminary Study |
| 15.00-15.15 | **OR-015:** XRF Analysis Of Trace Element In River Bank Soil By The Effect Of Electrokinetic-Assisted Phytoremediation |
| 15.15-15.30 | **OR-016:** Bacterial Cellulose From Rice Waste With Addition Of Chitosan |





### Room 2 (Chemistry)

| Session 1 | |
|---|---|
| **Chairperson: Dr.Hari Sutrisno** | |
| Time | Presenter |
| 10.15-10.30 | **OR-017:** Adsorption Of Technical Direct Red Dye By *Tanduk* And *Kepok* Banana Peels |
| 10.30-10.45 | **OR-018:** Hernagine Type Of Aporphine Alkaloids From *Alseodaphne Perakensis* |
| 10.45-11.00 | **Or-019:** Review Of $LiNiO_2$ System And Their Derivative As Cathode For Lithium Ion Batteries |
| 11.00-11.15 | **OR-020:** Studies On The Hydrogen Evolution Reaction On Fe-Co/S, FeNi/S And Co-Ni/S Electrodes |
| 11.15-11.30 | **OR-021:** Adsorption And Photocatalysis Of Nicotine In Cigarettes Smoke Using $Tio_2$ Embedded In Activated Carbon From Tobacco (Nicotiana Tabaccum) Stem Waste |
| 11.30-11.45 | **OR-022:** Effect of DOPE-PEG 2000 on Oleic and Linoleic Fatty Acid Liposomes |
| 11.45-12.00 | **OR-023:** Pore Formation and Doping Process on the Sol Gel Synthesis of Nanocrytalline Nitrogen-doped Titania |
| 12.00-12.15 | **OR-024:** Raman spectroscopy Study of carbon nanotube prepared using ferrocene-fermented tapioca-chemical vapour deposition |
| 12.15-12.30 | **OR-025:** Molybdenum Complexes with Amino Acids as Antihyperglicemic Agent : Preparation and Spectroscopic Studies |
| 12.30-12.45 | **OR-026**: DNA Binding Properties of Ruthenium(II) Polypyridyl Complexes. |
| Lunch | |
| **Session 2** | |
| **Chairperson: Prof. Endang Widjajanti Laksono** | |
| 14.00-14.15 | **OR-027**: Electronic States of Vanadium-doped Anatase $TiO_2$ by First Principles Calculations |
| 14.15-14.30 | **OR-028:** Effect of Electron Beam Irradiation on the Molecular Weight of Hydrolyzed Collagen |
| 14.30-14.45 | **OR-029:** Conductivity Behaviour Of Polyacrlamide-Methane Sulfonic Acid Gel Polymer Electrolyte In Tin-Air Battery. |
| 14.45-15.00 | **OR-030:** Solar Photocatalytic Degradation Of Azo Dye New Coccine In Solution With Zinc Oxide Sodium Alginate Beads |
| 15.00-15.15 | **OR-031:** Solar-Photocatalytic Degradation of Phenol Using Zinc Oxide Prepared by Precipitation Method |
| 15.15-15.30 | **OR-032:** Effect Of Inconsistent Organic Loading On The Development Of Aerobic Granulation In Sequencing Batch Reactor |

OR-010

# SURFACE COMPLEXATION MODEL OF THE SORPTION OF PHOSPHATE IONS BY MONTMORILLONITE

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The sorption of phosphate by montmorillonite was investigated at 30 °C. The purpose of this investigation is to determine the adsorption reactions and their equilibrium constants. Data were collected from adsorption edge experiments investigating the effect of pH, adsorption isotherms enabling the effect of sorbate concentration, acid-base titration calculating protons released or taken up by adsorption process, and sorption kinetics studying time needed by the sorption process to reach the equilibrium. The extended constant capacitance surface complexation model (ECCM) was used to determine the adsorption reactions and their constants, which then used as fixed parameters to model adsorption edge and adsorption isotherm data. The ECCM and X-ray Diffraction measurement indicated that the phosphate interacting montmorillonite surface by forming two *outer-sphere* surface complexes through hydrogen bonding. In first complex, $[(XH)^0 - H_2L^-]^{-1}$, the phosphate was held to permanent-charge $X^-$ sites on the tetrahedral siloxane faces. The second complex, $[[(SO^-)(SOH)]^- - [H_2L]^-]^{-2}$, is due to the interaction between the phosphate and variable charge surface hydroxyl groups at the edges of montmorillonite crystals and on the octahedral alumina faces.

# SURFACE COMPLEXATION MODEL OF THE SORPTION OF PHOSPHATE IONS BY MONTMORILLONITE

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## ABSTRACT

The sorption of phosphate by montmorillonite was investigated at 30 °C. The purpose of this investigation is to determine the adsorption reactions and their equilibrium constants. Data were collected from adsorption edge experiments investigating the effect of pH, adsorption isotherms enabling the effect of sorbate concentration, acid-base titration calculating protons released or taken up by adsorption process, and sorption kinetics studying time needed by the sorption process to reach the equilibrium. The extended constant capacitance surface complexation model (ECCM) was used to determine the adsorption reactions and their constants, which then used as fixed parameters to model adsorption edge and adsorption isotherm data. The ECCM and X-ray Diffraction measurement indicated that the phosphate interacting montmorillonite surface by forming two *outer-sphere* surface complexes through hydrogen bonding. In first complex, $[(XH)^0 - H_2L^-]^{-1}$, the phosphate was held to permanent-charge $X^-$ sites on the tetrahedral siloxane faces. The second complex, $[[(SO^-)(SOH)]^- - [H_2L]^-]^{-2}$, is due to the interaction between the phosphate and variable charge surface hydroxyl groups at the edges of montmorillonite crystals and on the octahedral alumina faces.

**Keywords**: phosphate; montmorillonite; outer-sphere complex; extended constant capacitance surface complexation model (ECCM).

## A. INTRODUCTION

As an agronomical region, Indonesia has land and water containing excess phosphate with high concentration. The excess phosphate can be from the use of fertilizer or the waste of industrial activities. The high concentration of phosphate in the natural environment can decrease water quality that results in serious problem to human life.

The excess of phosphate can carry the growth of superfluous plants in water system in Indonesia, which is worrying. For instance, the growth of water plants called *Enceng Gondok* in Indonesian rivers and lakes, which are used to cause serious