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PROCEEDING

THE INTERNATIONAL CONFERENCE ON MATHEMATICS, SCIENCE, EDUCATION AND TECHNOLOGY

ICOMSET 2015

Education, Mathematics, Science and Technology for Human and Natural Resources

October 22, 2015

Inna Muara Hotel and Convention Center
Padang, Indonesia

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The International Conference on Mathematics, Science, Education and Technology

(ICOMSET 2015)

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Organized by

Faculty of Mathematics and Science
State University of Padang
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Message

from the

Rector of State University of Padang

Ladies and Gentlemen,

It give me great happiness to extend my sincere and warm welcome to the participants of the International Conference on Mathematics, Science, Education and Technology (ICOMSET 2015). On behalf of Universitas Negeri Padang, let me welcome all of you to the conference in Padang, West Sumatra Province, Indonesia.

We believe that from this scientific meeting, all participants will have time to discuss and exchange ideas, findings, creating new networking as well as strengthen the existing collaboration in the respective fields of expertise. In the century in which the information is spreading in a tremendous speed and globalization ia a trend. Universitas Negeri Padang must prepare for the hard competition that lay a head. One way to succeed is by initiating and developing collaborative work with many partners from all over the world. Through the collaboration in this conference we can improve the quality of our researches as well as teaching and learning process in mathematics, science and technology.

I would like to express my sincere appreciation to FMIPA UNP and organizing committee who have organized this event. This is a great opportunity for us to be involved in an international community. I would also like to extend my appreciation and gratitude to keynote speakers and participants of this conference for their contribution to this event.

Finally, I wish all participants get a lot of benefits at the conference. I also wish all participants can enjoy the atmosphere of the city of Padang, West Sumatra.

Thank you very much

Prof. Dr. Phil. Yanuar Kiram
Rector

Message

from the

Dean of Faculty of Mathematics and Science
State University of Padang

Rector of State University of Padang
Vice-Dean of Faculty, Mathematics and Science
Head of Department in Faculty of Mathematics and Science
Distinguished Keynote Speakers
Organizers of this conference
Dear participants
Ladies and gentlemen

I am delighted and honored to have this opportunity to welcome you to ICOMSET 2015 - the International Conference on Mathematics, Science, Education and Technology, which is hosted by Faculty of Mathematics and Science, State University of Padang.

As the Dean of Faculty of Mathematics and Science, I wish to extend a warm welcome to colleagues from the various countries and provinces. We are especially honored this year by the presence of the eminent speaker, who has graciously accepted our invitation to be here as the Keynote Speaker. To all speakers and participants, I am greatly honored and pleased to welcome you to Padang. We are indeed honored to have you here with us.

The ICOMSET organization committee and also the scientific committee have done a great work preparing our first international conference and I would like to thank them for their energy, competence and professionalism during the organization process. For sure, the success I anticipate to this conference will certainly be the result of the effective collaboration between all those committees involved.

This conference is certainly a special occasion for those who work in education, mathematics, science, technology, and other related fields. It will be an occasion to meet, to listen, to discuss, to share information and to plan for the future. Indeed, a conference is an opportunity to provide an international platform for researchers, academicians as well as industrial professionals from all over the world to present their research results. This conference also provides opportunities for the delegates to exchange new ideas and application experiences, to establish research relations and to find partners for future collaboration. Hopefully, this conference will contribute for Human and Natural Resources.

I would like to take this opportunity to express my gratitude to all delegates and sponsors for their full support, cooperation and contribution to the ICOMSET 2015. I

also wish to express my gratitude to the Organizing Committee and the Scientific Committee for their diligence. The various sponsors are also thanked for their kind support.

In closing, I realize that you are fully dedicated to the sessions that will follow, but I do hope you will also take time to enjoy fascinating Padang, with its tropical setting, friendly people and multi-cultural cuisine.

I wish the participants a very fruitful and productive meeting and with that. Finally, we respectfully request the Rector of State University of Padang to open the ICOMSET 2015 officially.

Thank you,

Faculty of Mathematics and Science
Prof. Dr. Lufri, M.S.

Message

from the

Chairman of Organizing Committee

Firstly, I would like to say welcome to Padang Indonesia. It is an honor for us to host this conference. We are very happy and proud because the participants of this conference come from many countries and many provinces in Indonesia.

Ladies and gentlemen, This conference facilitates researchers to present ideas and latest research findings that allows for discussion among fellow researchers. Events like this are very important for open collaborative research and create a wider network in conducting research.

In this conference, there are about 120 papers that will be discussed from various aspects of mathematics, science, technology, education and other related topics.

For all of us here, I would like to convey my sincere appreciation and gratitude for your participation in this conference.

Thank you very much

Drs. Hendra Syarifuddin, M.Si, Ph.D
Chairman

Socially Response-able Mathematics, Science and Technology Education: Quality, Engagement, and Sustainability

Bill Atweh

ABSTRACT

In this talk I will outline an approach to the teaching of mathematics, science and technology education based on social responsibility (or Response-ability). I will argue that the primary role MSTE the development of active citizenship. I will present basic components of the Social Response-able Education approach toward developing school knowledge in meaningful way and towards achieving this primary goal. I will illustrate this approach through a project involving schools in Western Australia.

NEW PATHS FOR HALF-METALLIC AND FERROMAGNETIC IN OXIDES

Andrivo Rusydi
National University of Singapore

ABSTRACT

The search for high performance soft-magnet with high resistivity has been intense recently, driven by the strong demand in energy sector, such as energy generation, electrical motor, transformer and other energy efficient devices. Apart from hard-magnets, soft-magnets also play an important role in many engineering applications. Here, we introduce new paths to generate room temperature soft magnets with high resistivity by manipulating electronic structure of a materials. We will give example of well-known as non-magnetic materials such as TiO_2, ZnO, and even magnetic Fe_3O_4.

The Design of Solid Catalysts: Some Examples from Universiti Teknologi Malaysia

Hadi Nur

Centre for Sustainable Nanomaterials, IbnuSina Institute for Scientific and Industrial Research, UniversitiTeknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia
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ABSTRACT

The design and synthesis of particulate materials for new catalyst systems with novel properties remain a big challenge today. Here an attempt has been made to synthesize metal oxide particulate materials for several heterogeneous catalytic and photocatalyticsystems, which contain examples from our recent research projects in this area. The particulate metal oxidecatalysts have been designed for single centre catalyst, phase-boundary catalyst, bifunctional catalyst, photocatalyst and chiral catalyst. In our current research, the synthesis of well-aligned titanium dioxide catalyst with very high length to the diameter ratio was also demonstrated for the first time by sol-gel method under magnetic field with surfactant as structure aligning agent.

Keywords: *Particulate materials; Heterogeneous catalytic system;Synthesis of titanium dioxide under magnetic field; Liquid-gas boundary catalyst; Bifunctional catalyst; Photocatalyst.*

A Millimeter-Wave GBSAR for Landslide Monitoring

Ir. Dr. Chan Yee-Kit[1], Ir. Dr. Koo Voon-Chet[2]

[1] *Associate Professor, Center for Remote Sensing and Surveillance Technologies, Multimedia University, Malaysia*
[1] *Professor, Center for Remote Sensing and Surveillance Technologies, Multimedia University, Malaysia*

ABSTRACT

Every year, over one million people are exposed to weather-related landslide hazards around the World. Due to the recent climate change, it is likely that the decrease of permafrost areas, changes in precipitation patterns and increase of extreme weather events will influence the weather-related mass movement activities. This paper reports the recent development of a ground-based synthetic aperture radar (GBSAR) for continuous monitoring of landslide-prone areas in Malaysia. It is an ultra-wideband system operating at K-band with spatial resolution of 0.5 m in range and 2.9 mrad in cross range. The system is mounted on a rail which travels along a linear guide to achieve SAR imaging. The GBSAR has been installed at a test site to provide timelyinformation for landslide monitoring and early warning system. The paper discusses the design, development and field experiments using the new GBSAR system.

Keywords : *Synthetic Aperture Radar, Interferometry, Landslides, Millimeter-wave, Environmental Monitoring*

NOVEL BACTERIAL CELLULOSE WITH WELL ORIENTED FIBRILS ALIGMENT: SYNTHESIS AND CHARACTERIZATION

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ABSTRACT

Bacterial cellulose (BC) having oriented fibrils alignment can be synthesized by *Acetobacter xylinum (A. xylinum)* at the liquid/oxygen-permeable substrate interface in a static cultivation process. We discovered that BC gel produced on ridges polydimethylsiloxane (R-PDMS) shows uni-axially oriented fibrils alignment along the ridge direction of substrate. The degree of orientation of BC gels increases with the decrease in the ridge size of the PDMS substrate. An optimum ridge size of 4.5 μm was observed where the BC gels show the highest birefringence (Δn), the highest fracture stress (σ), highest swelling degree (*q*), the lowest elastic modulus (*E*), and the thickest BC fibril. We also found that culturing a tubular BC (BC-TS) gel in oxygen-permeable silicone tubes with inner diameter <8 mm yields the BC-TS gel of the desired length, inner diameter, and thickness with uni-axially oriented fibrils along the longitudinal axis of the silicone tube. Thus, BC with a uni-axially oriented fibril structure and excellent mechanical properties holds promise for use as a micro vessel or soft tissue material in medical and pharmaceutical applications

Index Terms— BC, *A. xylinum*, static cultivation, liquid/oxygen-permeable substrate interface, oriented fibrils

ASSESSMENT OF TRACE PB (II) IN SLUDGE FROM BATANG ANAI RIVER'S PADANG

Indang Dewata[1] *and Edi Nasra*
Departement of Chemistry State University of Padang
[1]i_dewata@yahoo.com

ABSTRACK

The concentration of trace Pb (II) in sludge samples from Batang Anai River's Padang were investigated in this study. The samples collected from three location and each location consist of three point sampling. In this study, Pb(II) were determined in some sludge samples after development $Al(OH)_3$coprecipitation procedure using flame atomic absorbtion spectrometry (FAAS). Trace amounts of Pb (II) were quantitatively coprecipitated with $Al(OH)_3$ at pH 6 and the coprecipitant could be easily dissolved with 1 mol dm^{-3} nitric acid. The proposed method was successfully applied to determination of lead in sludge samples.

Index Terms---coprecipitation, lead, FAAS, sludge

1. INTRODUCTION

Lead (Pb) is a common metal that is largely consumed in indrustrial fields. However, the emission of Pb to atmospheric and aquatic environments is stricly controlled under some regulations for enviromental protection, since it has high toxicity for animals and human beings. Analysis for Pb in enviromental samples has been performed by many techniques and methods. Since the concentrations of Pb in enviromental water samples are extremely low, sensitive instruments suc as ICP-MS, neutron activation analysis and electrochemical analysis have been used for the determination.

Coprecipitation is widely used for concentration of trace metals prior to various determination techniques including flame atomic absorption spectrometry. However, the coprecipitation is sometimes troublesome and time-consuming during filtration, which is frequently used for collection of precipitate. Some techniques such as flotation have been used to alleviate the weak points; a rapid coprecipitation technique is also one of the most useful ways.

This paper describe the fundamental conditions for the coprecipitation of trace amounts of lead in water with aluminium hydroxide and for the determination of these ions by flame atomic absorption spectrometry.

2. EXPERIMENTAL

2.1 Apparatus

A flame atomic absorption spectrometer AA1009M013 with Hitachi lead hallow-cathode for Atomic Absorption measurement. The optimum operating conditions, which were studied using a solution obtained by coprecipitation according to the recommended procedure from distilled water containing 100 ng of lead, are summarized in table 1. For pH measurement, a Hitachi-Horiba Model M-5 glass electrode pH meter was used.

2.2 Reagents

Lead Solution. A solutions containing about 1 mg cm^{-3} of lead was prepared by dissolving guaranteed reagent-grade metal nitrate in small amount of concentrated nitric acid and diluting with distilled water. The concentrations of lead were determined by complexometric titration using murexide as indicators.

Alumunium Hydroxide. About a 15 mg cm^{-3} alumunium solution was prepare by dissolving alumunium nitrate in distilled water. The alumunium concentration was determined at pH of about 2 bycomplexometric titration using xylenol orange as an indicator. All other reagents used were of guaranteed reagent grade.

2.3 Recommended procedure

To a sample solution (up to 200 cm^3) containing up to 100 ng of lead, 4 mg of aluminium is added, exactly, and the pH of the solution is adjusted to about 9.5 with a 0.1 mol dm^{-3} sodium hydroxide solution. To settle the produced precipitate, the solution is allowed

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to stand for a few minutes; the precipitate is then collected on a Toyo Roshi PTFE membrane filter (pore size 0.5 μm, diameter 25 mm), filtered by suction, washed with a small amount of distilled water, and dissolved with 0,5 cm^3 of 1 mol dm^{-3} nitric acid. The atomic absorbances of lead were measured under the operating conditions given in Table 1. A blank using distilled water was rum according to the same procedure as that for the sample solution. In this work the blank could be neglected in most instances because it was extremely small.

If it is difficult to make up the final volume to 0.5 cm^3 with good reproducibility, the following measurement is recommended: taking 10 mm^3 of the final solution, the amount of lead in it (M_1 ng) is measured byflame atomic absorption spectrometry under the operating conditions given in Table 1. Taking another portion of the solution ($V$$mm^3$), the amount of aluminium in it (S mg) is measured by complexometric titration using Xylenol Orange as an indicator. A blank is also run using distilled water as a sample solution. The content (M_0 ng) of lead in the original sample solution is calculated using the following equation:

$M_0 = M_1$ x (V/10) x (4/S)

Table 1. Operating conditions for the atomic absorption spectrometer

Analytical wavelength	217,0 nm
Lamp current	10 mA
Slit width	1,0 nm
Measurement time	3,0 s
Flame type	Air/acetylene
Air flow	3,5 L/min
Acetylene	1,50 L/min
Burner height	0,0 mm

2.3.1. Calibration curves

Straigh lines passing through the origin were obtained up to 100 ng of lead in te final solution using the recommended procedure. The relative standard deviations obtained from five repeated determinations were 4.7 %. For 50 ng of lead, respectively. The detection limits (signal/noise=2) were 5.0 pg cm^{-3} of lead in 200 cm^3 of the initial sample solution.

2.3.2. Interferences

According to the recommended procedure, the effect of 27 foreign ions on the determination of 50 ng of lead was examined. Table 2 show that large amounts of sodium, potassium, magnesium, and calsium did not interfere for both determinations. No other ions tested produced any serious enterference effect, even at a concentration 500-times the mass of lead present.

3. RESULTS AND DISCUSSION

The first year of the study consisted of two phases, namely :

a Determination of the optimum conditions coprecipitationPb 2+ ions with coprecipitant$Al(OH_3)$simultaneously measuring analytical performance.

b Finding the influence of other ions such as Cu^{2+} , Cd^{2+}, Zn^{2+}, Co^{2+}, and Ni^{2+} on the determination of Pb^{2+} and preconcentration using $Al(OH)_3$ as coprecipitant .

In principle, preconcentration using coprecipitation using colloidal adsorption properties of precipitant, $Al(OH)_3$ is used. When in a solution containing the analyteAl^{3+},NaOH added, then formed colloidal $Al(OH)_3$ negatively charged. These colloids will adsorb positive ions of metal, and when dicentrifuge will precipitate together, as can be seen in the illustration in Figure 1.

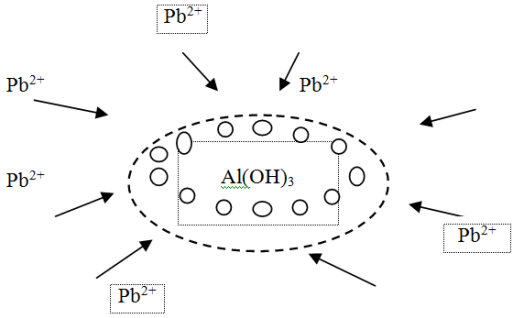

Fig 1. Pb^{2+} ion adsorption scheme by Coprecipitant

$Al(OH)_3$ chosen as coprecipitant because of its Ksp value which is smaller than the analyte (Ksp $Al(OH)_3$ = 5 x 10^{-33}) that will form the hydroxide first and then adsorbs metal ions. Because of the ability of adsorbed almost the same, then the influence of other metals in the determination of Pb 2+ important to know. Therefore, the optimum condition of ions bullies need to be known to be anticipated interruption of the metal ions .

Study of the optimum conditions for coprecipitant Effect of the pH on coprecipitation. The effect of the pH on coprecipitation with aluminium hydroxide was studied with a solution containing 40 mg lead. The maximum and almost constant recoveries were obtained in te pH range of 5.0 – 9. The precipitate aluminium hydroxide, obtained as mentioned above, at a pH 6.0 was bulky, and hence easily handled. Therefore, the pH was adjusted to about 6.5 with a 0.1 mol/L sodium hydroxide solution in further experiments.

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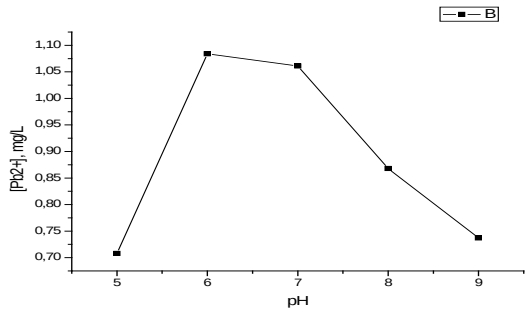

Fig 2. Effect of the pH on recovery of lead

Effect of the amount of coprecipitant. According of the recommended procedure, the necessary amount of aluminium for coprecipitation was examined with a sample solution (up to 500 mL) containing 10 ng of lead. The required amount of alumunium for quantitaive coprecipitation increase along with increasing the sample volume, and 25 mg alumunium was needed for at least up 500 mL of the sample solution. Since the atomic absorption of lead was not affected by the presence of up to 74 mg of alumunium in the final sample solution (5 mL)

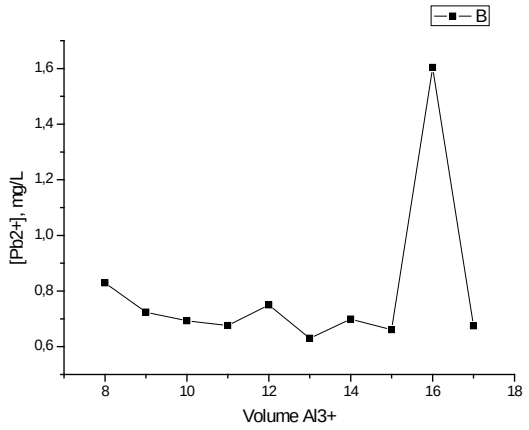

Fig 3. Effect of alumunium on recovery of lead

Contact time. Contact time duration associated with Pb^{2+}coprecipitation process by $Al(OH)_3$ which can be seen in Figure 4.

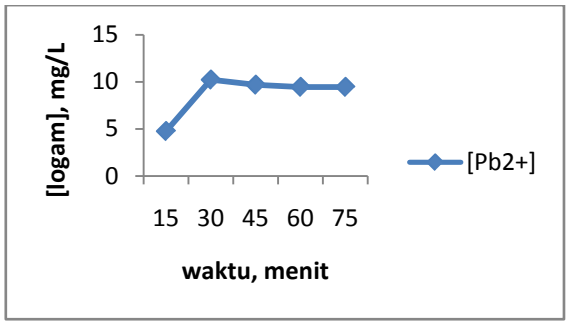

Fig 4.Effect of contact time on the coprecipitation of metal ions on $Al(OH)_3$.

From the picture it can be seen that the coprecipitation process occurs in a relatively long time is 30 minutes. Over a period of 30 minutes, quit stable metal ions adsorbed on the surface of colloidal shown by the metal concentrations were *measured* at the time of contact 45-75 minutes relatively constant (9.437 to 9.67 mg / L) and not too much less than at the time of contact 30 minute concentrations of metals 10.214 mg / L.

Eluent Volume. Metal ions adsorbed on the surface of colloidal $AL(OH)_3$ can be detected by using AAS after eluted with HNO_3. HNO_3 volume variation is used to elute the metal ions adsorbed can be seen in Figure 5.

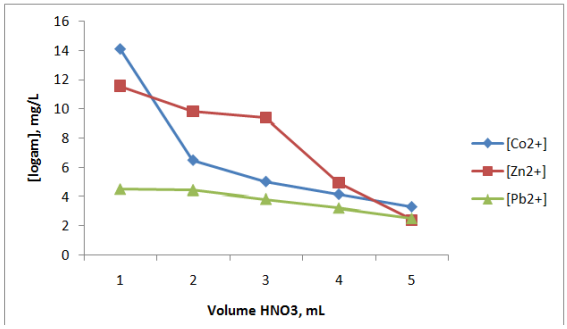

Fig 5.Effect of HNO3 volume as the eluent to coprecipitation of metal ions on $AL(OH)_3$.

HNO_3 is used as the eluent related to the solubility of nitrate salts of each metal are great in the water. Of the three metal ions adsorbed by $Al(OH)_3$, decreased due to the dilution factor. The smaller the volume of eluent more metal ions are detected because the larger the concentrated factor.

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