SATU Presidents' Forum
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台灣與東南亞暨南亞大學校長論壇

National Cheng Kung University
No. 1, University Road,
701 Tainan City, Taiwan
: +886-6-2099250
: +886-6-2373551
: satu@email.ncku.edu.tw
: http://conf.ncku.edu.tw/satu

2016 SATU Joint Research Scheme Program

Host Application Form

Date: __22__ / __04__ / _2016_ (year /month/day)

1. Host University

Universiti Sains Malaysia

2. Host Unit

School of Chemical Sciences

3. Joint Research Project Title

Crystallization and Catalytic Behavior of Cesium-based Zeolite Nanocrystals Prepared in Organotemplate-free Hydrogel System

4. Principal Investigator

Passport Name	Ng Eng Poh		
Nationality	Malaysian	Gender	Male
Address	School of Chemical Sciences, Universiti Sains Malaysia, 11800 USM, Malaysia.		
Telephone	(Office) +604-6534021 (Home / Mobile) +6012-7421053		
Fax Number	+604-6574854	E-mail	epng@usm.my

5. Co- PI from the same unit – If any

Passport Name	Mohammad Anwar Mohamed Iqbal		
Nationality	Malaysian	Gender	Male
Address	School of Chemical Sciences, Universiti Sains Malaysia, 11800 USM, Malaysia.		
Telephone	(Office) +604-6533565 (Home / Mobile)		
Fax Number	+604-6574854	E-mail	anwariqbal@usm.my

6. Project Details

Project Description	Zeolites are crystalline porous aluminosilicates which have well defined channels and cavities. Zeolites are commonly used in ion exchange, catalysis and separation processes due to their unique crystalline structure and tunable surface properties. Subdivision of zeolites into fine particles (<100 nm) leads to immense external

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surface areas, and affects the magnetic, optical, electric and catalytic properties. As a result, such nanocrystals brings unique properties to the structures prepared and expand the area of zeolite applications toward atomic energy production, food, paper, drug delivery, ceramics, paints, electronics, recording materials, lubricants, detergents and so on. While more than 200 zeolites are known today, only 14 types of aluminosilicate zeolites can be synthesized in nanomater scale.

Synthesis of zeolite nanocrystals involves hydrothermal treatment using harmful organic additives as the templates and to control the size of zeolite crystals. On the other side, nanosized zeolites can also be crystallized in sodium-rich hydrogel system where the alkaline metal cations used can be functioned as low-cost inorganic templates.

Cesium-based zeolite, is highly demanded due to its strong basic property. The first work describing the characterization of pure Cs-aluminosilicate zeolite with ABW topology (8-membered ring and one-dimensional channel, 3.4 × 3.8 $Å^2$) was reported in 1970s. Since then, the synthesis of Cs-zeolite is rarely reported considering its tedious and dangerous synthesis that requires high temperature (700-1200 °C) and high pressure (>1000 bar) for crystallization. Furthermore, nanosized Cs-zeolite has not been reported so far. Synthetic Cs-zeolite is interesting because it can be used in many applications such as basic catalysts and hosts for immobilization of radioactive cesium. Mild and safer synthesis condition with lower heating temperature and pressure remains challenging in Cs-zeolite synthesis, and hence it is our intention in this project to synthesize and follow the crystal growth of nanosized Cs-zeolite in organotemplate-free media. The basicity of nanosized Cs-zeolite is further studied using *in-situ* Pyrrole adsorption coupled with infrared spectroscopy and basic-catalyzed reactions. From an environmental perspective, this synthesis is extremely beneficial as it can be used to prepare pure nanosized Cs-based molecular sieves in an eco-friendly way by using safer synthesis condition.

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7. **Acknowledgement** (Signed by the President or SATU representative to show recognition)

Name
title

PROFESSOR DATO' OMAR OSMAN
Vice-Chancellor
Universiti Sains Malaysia
11800 Penang
Malaysia

_____ **(signature)**

Date: 2016 / 04 / 25 **(yyyy/mm/dd)**

Please email satu@email.ncku.edu.tw before 2016.4. 29(Fri.) for application with the subject line: < 2016 SATU JRS host application –School Name>. Thank you.