

SATU Presidents' Forum

of Southeast and South Asia and Taiwan Universities
台灣與東南亞暨南亞大學校長論壇

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2016 SATU Joint Research Scheme Program Host Application Form

Date: 2016 / 04 / 25 (year / month / day)

1. Host University

University of Malaya

2. Host Unit

Mechanical Engineering

3. Joint Research Project Title

Preparation, Characterization and Performance Studies of Nanocellulose Based Biocomposites.

4. Principal Investigator

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5. Co- PI from the same unit – If any

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6. Project Details

Project Description	Nanocelluloses are considered as fascinating building blocks for functional materials due to their high mechanical properties, rod-like or fibrous structure, biocompatibility and sustainability. In addition, they own high surface area with numerous free reactive groups offering great opportunities for chemical or physical functionalization. Among nanocelluloses, native cellulose nanofibrils form an important class of
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materials and show high potential to be developed as as building blocks for functional and responsive materials. This project is aim to contribute basic research on nanocelluloses, while yielding concrete benefits for the industrial context. At stage 1 of the study, the characteristics of enzymatically and mechanically prepared cellulose nanofibrils are investigated. The cellulose is dissolved in ionic liquid to form strong inherent hydrogels at low concentration without chemical cross-linking. In stage 2, the hydrogel will be vacuumed freeze-drying using supercritical CO₂ to form light-weight aerogels which are ductile and deformable. Stage 3, the tunable morphology is expected to provide multiple length scale structures and porosity, as well as percolative template for conducting polymer. The aerogels prepared from the long and entangled cellulose nanofibrils, are also versatile templates for titanium dioxide (TiO₂) and fluorosilane deposition to tune the wetting, and to enable responsive materials. In stage 4, the switchable water absorption of TiO₂-coated nanocellulose aerogel between nonabsorbent and superabsorbent states upon exposure of UV light is studied. Besides, the photo-catalytic activity of TiO₂-coated aerogel is also investigated. The superoleophobic and hydrophobic bio-inspired nanocellulose cargo carrier is developed in stage 5 with various effect of multiple length scaled structures and pore dimensions. The floatable oil-absorbing peroperties of nanocellulose aerogel is demonstrated for oil spill removal. These studies will not only further the fundamental understanding of the behavior of cellulose nanofibrils, but they also suggest novel types of sustainable value-added applications in materials science beyond the classic cellulose applications.

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

Name
title

PROFESSOR DR. NOORSAADAH ABD. RAHMAN
Deputy Vice-Chancellor
(Research & Innovation)
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50603 Kuala Lumpur

Date:

28 / 04 / 2016

(signature)

(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.