

# 3<sup>rd</sup> International Conference and Exhibition on Materials Science & Engineering

October 06-08, 2014 Hilton San Antonio Airport, USA

## Comparative Study of microstructural, electrochemical and tribo-mechanical properties of electrodeposited Zn-Al<sub>2</sub>O<sub>3</sub>/Cr<sub>2</sub>O<sub>3</sub>/SiO<sub>2</sub> nanocomposite coatings

N Malatji and A P I Popoola

Tshwane University of Technology, South Africa

Nano-sized particle incorporation into metal matrix for fabrication of advance surface coatings finds variety of applications in surface protection techniques. Al<sub>2</sub>O<sub>3</sub>, Cr<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> nanoparticles have been codeposited with Zn using electrodeposition process to produce Zn nanocomposite coatings. The fabricated coatings were characterized using Scanning Electron Microscope affixed with Energy Dispersive Spectroscopy and X-ray diffractometer. The mechanical and tribological properties of the coatings were investigated using diamond microhardness indenter and CETR tribo-tester. The results revealed that the incorporated nanoparticles induce grainrefinement and modify preferred crystallographic orientation of Zn matrix. The composite coatings exhibited excellent self-lubricating properties and improved microhardness yield. Electrochemical and thermal stability studies revealed that the composite coating possessed improved corrosion resistance and were thermally stable up to 16 hours of heat treatment at 250°C. Comparative studies indicated that Zn-Al<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> composite coatings possessed better surface properties while incorporation of Cr<sub>2</sub>O<sub>3</sub> improved mostly the mechanical properties. Therefore, Zn-Al<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub> proved to be better coatings which can find variety of industrial applications where both mechanical and electrochemical properties are required.

### Biography

N Malatji holds a Bachelors Degree in Metallurgical Engineering from Tshwane University of Technology. He is currently doing his masters degree in Metallurgical Engineering from the same institution and his project is based on surface coatings and technology.

[doublen.malatji@gmail.com](mailto:doublen.malatji@gmail.com)

## Preparation of microcapsules containing resin A as core

Nurshafiza Shahabudin, Rosiyah Yahya and Seng Neon Gan

University of Malaya, Malaysia

This work reports the preparation of poly(urea-melamine-formaldehyde) (PUMF) microcapsules with a synthesized resin A as core and the PUMF as the shell. Poly(vinyl alcohol) (PVA) and ethylene maleic anhydride (EMA) were used as emulsifier. The effect of various parameters on the microencapsulation of the PUMF/A microcapsules was studied, these include dispersed phase to continuous phase ratio, agitation rate and surfactants concentration. The microcapsules obtained were inspected using digital microscopy, optical microscopy (OM) and also field emission scanning electron microscopy (FESEM). The resin core content and the PUMF shell materials was verified using Fourier transform infrared (FTIR) and differential scanning calorimetry (DSC). Thermal analysis by TGA has shown that the core and shell materials have different thermal stabilities. The resultant microcapsules appear white-yellowish and free-flowing, and have a rough, non-porous shell which was formed by PUMF nanoparticles. Their diameters range from 500 to 150 microns. The size of the microcapsules is controllable by the agitation rate and the ratio of the dispersed phase to continuous phase.

### Biography

Nurshafiza Shahabudin is currently enrolled at University of Malaya for her PhD in Polymer chemistry. She received her MSc from the same university in Polymer chemistry and dental technology.

[shafizashah@gmail.com](mailto:shafizashah@gmail.com)