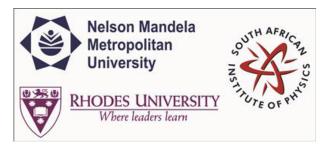
**SAIP2015** 



Contribution ID: 188

Type: Oral Presentation

### Simultaneous substitution of Ba, Mn and Co into Fe<sub>3</sub>O<sub>4</sub> spinel structure: Magnetic and electrochemical sensing properties of the synthesized nanoparticles

Wednesday, 1 July 2015 14:00 (20 minutes)

### Abstract content <br> &nbsp; (Max 300 words)<br><a href="http://events.saip.org.za/getFile.py/a target="\_blank">Formatting &<br>Special chars</a>

Simultaneous substitution of Ba, Mn and Co was successfully achieved by glycol thermal route. The phase formation was confirmed by X-ray powder diffraction technique. The microstrain is investigated based on the Williamson-Hall plot. Crystallinity, shape and size of the nanoparticles were investigated by high resolution transmission electron microscopy and high resolution scanning electron microscopy. Brunauer-Emmet-Teller measurements revealed that the sample has high surface area of 116 m<sup>2</sup>/g. The sample displays mesoporous character based on the Barrett-Joyner-Halenda test. The magnetic properties as a function of temperature were performed on mini-cryogen free VTI system in the temperature range 4 K to 300 K. The magnetization increased from  $66.5 \pm 0.3$  emu/g to  $84.4 \pm 0.5$  emu/g from 300 K to 4 K respectively. The sample was found to become magnetically harder at low temperature since the coercivity increases from  $0.009 \pm 0.003$  T to  $1.01 \pm 0.004$ T for the temperatures 300 K and 4 K respectively. The temperature dependence of the coercive field followed Kneller's law, whilst a modified Bloch's law was suitable in describing the magnetization as a function of measuring temperature. The electrochemical properties of Ba<sub>1/3</sub>Mn<sub>1/3</sub>Co<sub>1/3</sub>Fe<sub>2</sub>O<sub> nanoparticles were also investigated. Cyclic voltammograms of ferricyanide oxidation showed that the synthesized nanoparticles modified electrode exhibited improved electrochemical activity as compared to the bare electrode. These high-performance electrodes are expected to lead to the development of a novel group of electrochemical sensors.

#### Apply to be<br> considered for a student <br> &nbsp; award (Yes / No)?

Yes

Level for award<br>&nbsp;(Hons, MSc, <br> &nbsp; PhD, N/A)?

PhD

#### Main supervisor (name and email)<br>and his / her institution

Thomas Moyo (Moyo@ukzn.ac.za)/School of Chemistry and Physics, Westville campus, University of KwaZulu-Natal.

# Would you like to <br> submit a short paper <br> for the Conference <br> Proceedings (Yes / No)?

Yes

# Please indicate whether<br>this abstract may be<br>published online<br>(Yes / No)

No

Primary author: Mr OSMAN, Nadir (University of KwaZulu-Natal)

**Co-authors:** Dr THAPLIYAL, Neeta (ukzn); Dr KARPOORMATH, Rajshekhar (ukzn); Dr MOYO, Thomas (University of KwaZulu-Natal)

Presenter: Mr OSMAN, Nadir (University of KwaZulu-Natal)

Session Classification: DPCMM

Track Classification: Track A - Division for Physics of Condensed Matter and Materials