Contribution ID: **211** Type: **Poster Presentation**

ZnMn₂O₄-Based Anode Materials for Advanced Li-ion Batteries: A Study on the Impact of Co, Ni, and Cu partially substitution on Electrochemical Performance.

A series of ZnMn₂O₄ samples partially doped with 1.0 wt% Co, Ni, and Cu were synthesized via combustion method and evaluated for improved electrochemical performance. The synthesized powders were thoroughly characterized using XRD, FE-SEM, FTIR, and electrochemical techniques (GCD, CV, and EIS) to evaluate their performance as anode materials for supercapacitor batteries. The XRD results revealed that the incorporation of Co, Ni, and Cu metals did not alter the crystal structure of ZnMn₂O₄. However, the FE-SEM data showed that the addition of these metals modified the particle shapes and sizes. The optimum particle size of the doped ZnMn₂O₄ was found to be in the range of 36.33 - 41.29 nm. Notably, the Co-doped ZnMn₂O₄ exhibited superior performance in battery cycling tests (GCD), demonstrating exceptional discharge capacity, cycling stability, and rate capability compared to other manganites with 686.88 Fg⁻¹ specific capacitance. Furthermore, the Co-doped ZnMn₂O₄ showed great performance in (CV) at low scan rate of 5 mVs ⁻¹ with 48.85 Fg⁻¹ specific capacitance it also displayed a pseudo-capacitance behiviour. EIS demonstrated a great perfomenace for Cu-doped ZnMn₂O₄ having lowest resistance due to smallest-sermicircle. Furthermore due to it having a steeper vertical line, which suggests that it is good for supercapacitor applications. The excellent high-rate capability of the as-synthesized Co-doped nanocomposite indicates its promising potential as an anode material for high-power lithium-ion batteries.

Apply for student award at which level:

MSc

Consent on use of personal information: Abstract Submission

Yes, I ACCEPT

Primary author: BIXA, Samkelo

Co-authors: SONDEZI, Buyi (University of Johannesburg); Dr LETSWALO, Machaba Leanyatsa Abraham (University of Johannesburg)

Presenter: BIXA, Samkelo

Session Classification: Poster Session

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