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Structure-property correlation of cerium doped bismuth vanadate for energy application.

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The demand for electricity is rapidly growing in developing countries and electrochemical devices such as solid oxide fuel cells (SOFCs) have shown promising developments to mitigate the demand. SOFCs are devices that convert chemical fuels (such as CO, H2 and ethanol) directly into electrical energy and this process is more efficient than any combustion process. They reduce the dependence on coal and oil to produce electricity and are largely composed of pollutant-free materials. Bismuth vanadate (Bi2VO5.5) is commonly doped or co-doped with transitional metals to enhance its ionic conductivity and function as a SOFCs electrolyte. The study of Bi2VO5.5 doped with rare-earth metals is under-reported and this study addresses the current literature gap. We report the impact of doping Bi2VO5.5 with cerium at different concentrations levels using a soft chemistry method (the citrate method). The study focuses on understanding how cerium substitution affects Bi2VO5.5 properties, (such as thermal stability, phase transition behaviour and ionic conductivity). It was determined that lower dopant concertation of Ce (<13% mol) form multi-phased material composed of monoclinic and orthorhombic phases, while higher dopant concentrations (>23% mol), form orthorhombic phase. At room temperature, Raman spectroscopy for 13% mol Ce doped, the predominate phase was orthorhombic which also showed weak signals nassociated with a monoclinic phase which was not detected by PXRD measurements. Selected results will be presented.

Primary author: Mr MALIHASE, Dennis (University of the Witwatersrand)

Co-author: Prof. BILLING, Dave (University of the Witwatersrand)

Presenter: Mr MALIHASE, Dennis (University of the Witwatersrand)

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