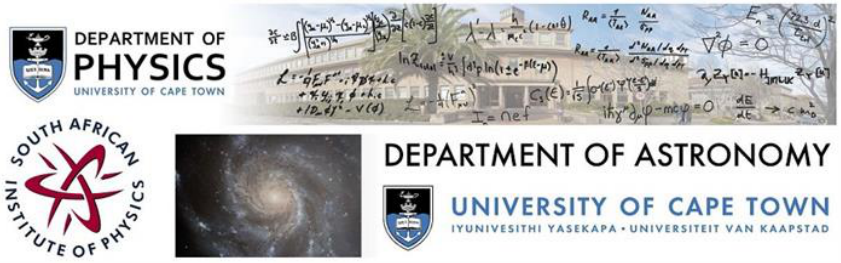

Contribution ID: **107** Type: **Oral Presentation**

Characterization of inclusions and defects in natural zirconia

Wednesday, 6 July 2016 10:20 (20 minutes)

Abstract content
   (Max 300 words)
Formatting &
Special chars

Minerals such as zircon (ZrSiO₄) and baddeleyite (natural zirconia, ZrO₂) are considered to be ideal materials for the geothermal and geochronology characterization of mineral deposits. For geochronology applications these two minerals are considered to be stable and undergo little or no physical or chemical alteration (closed systems) before or after the geological emplacement process. However, natural zirconia is a mineral which undergoes a martensitic phase transformation from cubic (2750℃) through tetragonal to monoclinic at about 1100℃. The material undergoes a volume change (5%) and strain energy (˜8%) during the tetragonal-monoclinic transformation which would be expected to have major influence on the material during the geological emplacement process. It is therefore important to apply a detailed microstructural analysis for natural zirconia which could possibly provide information on the nature of primary and secondary mineral inclusions as well as secondary physical alteration mechanisms for the material.

Baddeleyite (zirconia) xenocrysts from the Phalaborwa complex (South Africa), which has a geological age of 2060 plusmn;1 Ma, were used in this work to determine the nature of inclusions and defects in the material using a number of microanalytical techniques. These techniques include scanning (SEM) and transmission electron (TEM) microscopy supported by energy dispersive spectroscopy (EDS) and electron backscattered diffraction (EBSD).

Microanalysis results have shown the presence of monoclinic {001} and {011} twin bands in the material which could be a result of transformation or deformation processes. Secondary mineral inclusions observed in cracks (due to transformation stress) formed in the single crystalline material during emplacement will be shown to be related to the original mineral content of the magma. Lastly, a detailed report on the observation of extended defects such as loops and platelets will be reported. It will therefore be concluded that severe physical alteration for baddeleyite does in fact take place.

Apply to be
 considered for a student
   award (Yes / No)?

No

Level for award
 (Hons, MSc,
   PhD, N/A)?

N/A

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

No

Please indicate whether
this abstract may be
published online
(Yes / No)

Yes

Primary author: Prof. LEE, Mike (Centre for HRTEM, Nelson Mandela Metropolitan University, Port Elizabeth)

Co-authors: Dr JANSE VAN VUUREN, Arno (Centre for HRTEM, Nelson Mandela Metropolitan University, Port Elizabeth); Dr O'CONNELL, Jacques (Centre for HRTEM, Nelson Mandela Metropolitan University, Port Elizabeth); Mr GOOSEN, William (Centre for HRTEM, Nelson Mandela Metropolitan University, Port Elizabeth)

Presenter: Prof. LEE, Mike (Centre for HRTEM, Nelson Mandela Metropolitan University, Port Elizabeth)

Session Classification: Division for Physics of Condensed Matter and Materials (1)

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