



Contribution ID: 81

Type: **Poster Presentations**

Investigation of Letlhakane Mine DK/1 mudstones using diffraction methods

Tuesday, 17 November 2015 18:30 (2 minutes)

Letlhakane Mine DK/1 belongs to a cluster of about 85 kimberlite pipes, Orapa Kimberlitic Cluster, located approximately 240km west of the Francistown in the Boteti District of Central Botswana. It is one of the Orapa (AK/1) Letlhakane and Damtshaa (OLDM) diamond mines operated by Debswana Diamond Company. The OLDM are experiencing a huge variance coefficient of rock strength within the same lithology of which the cause has not yet been established. Several authors have investigated strength variation of the rock within the same lithology and formation on different geological setups and environments. However this variation of strength within the same lithology has not been linked to the petrographical parameters such as how grains are packed, grain size, grain shapes, cementing material and minerals. In addition the OLDM are faced with an issue of red-mudstone especially in the A/K1 and D/K1 pits. Upon exposure the red-mudstones crumble causing the top Mosolotshane sandstones to topple because the lower support has been weakened or removed. The objective of this work was to further explore the use of diffraction (X-ray diffraction, Synchrotron XRD and neutron diffraction) to determine the residual strain in country rock, as well to investigate the influence on the chemical composition and mineralogy.

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Session Classification: Poster Session

Track Classification: Main