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**Thermal stability as alternate indicator of ceramic potentials of selected South African kaolins**



Miyambu, M.O.<sup>1</sup>, Diko, M.L.<sup>1</sup>, Ekosse, G.E.<sup>2</sup> and Ogola, J.S.<sup>3</sup>

<sup>1</sup> Geology Division, University of Limpopo, South Africa ([dikom73@gmail.com](mailto:dikom73@gmail.com))

<sup>2</sup> Directorate of Research and Innovation, University of Venda.

<sup>3</sup> Department of Mining and Environmental Geology, University of Venda.

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Thermal stability is an important property of fired kaolin particularly for industrial applications. The mechanisms of dehydroxylation infer phase transformations and microstructural evolution of kaolin with temperature increase. In this study, the decomposition behaviours of two representative kaolin samples (S1 and S2) from the Duthuni Kaolin deposit (Limpopo Province, South Africa) were investigated by simultaneous differential scanning calorimetry (DSC) and thermogravimetry (TG). The DSC curve portrayed three endothermic peaks for S1 and S2 at 90°C/85°C, 300°C/295°C and 530°C/535°C corresponding to elimination of adsorbed water, goethite dehydroxylation and formation of metakaolinite respectively. A weak exothermic peak was observed at 955°C and 945°C for S1 and S2 respectively, suggesting recrystallization of metakaolinite to mullite. Mass losses were observed between 20°C to 120°C (2% - 7.2%), 250°C to 320°C (1.3% - 3.8%) and 400°C to 600°C (5.2% - 6.2%) in both samples. The relatively low kaolinite dehydroxylation temperature ( $\leq 535^\circ\text{C}$ ) coupled with the generally asymmetric shape of the endothermic peaks suggests a poorly ordered kaolin crystalline structure. Poor crystallinity infers significant contamination by impurities such as iron oxide, which tends to negatively impact on the application of Duthuni Kaolin in the manufacture of whitewares or white to cream fired bricks. In addition comparatively higher cumulative mass loss observed in S1 (16.2%) relative to S2 (10.5%) may also contribute towards the development of defects such as cracks during firing.

