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THERMOANALYTICAL CHARACTERIZATION, STABLE ISOTOPE AND PALEOENVIRONMENTAL CONSIDERATIONS OF KAOLINITE FROM TWO GENETIC SOURCES

Georges-Ivo E. Ekosse

Geology, Mining and Minerals Programs, University of Limpopo, P/B 1106 Sovenga, 0727 South Africa

SUMMARY

This study aimed at employing differential thermal analyses/ thermogravimetric analyses (DTA/TGA) and stable isotopes $\delta^{18}O$ and δD analytical techniques in understanding the mineral genesis of kaolinite from two genetically different sources in Botswana. The mineral contents of the samples were determined by X-ray powder diffraction (XRPD) technique and the loss on ignition by heating. Thermal characterization studies were conducted using differential thermal analyses/thermogravimetric analyses (DTA/TGA) techniques. Kaolinite was the dominant mineral in both deposits. Mean temperatures for endothermic peaks for Makoro kaolinite was 589 ^{o}C and for Kgwakgwe kaolinite 604 ^{o}C; and the mean temperatures for their exothermic peaks were 1025 ^{o}C for Makoro kaolinite and 1010 ^{o}C for Kgwakgwe kaolinite. Stable isotopes mean val-ues for kaolinite from both Makoro and Kgwakgwe were as follows: $\delta^{18}O$ for Makoro = +14.0 ± 0.5‰ and for Kgwakgwe = +14.8 ± 0.5 ‰; and the δD for Makoro = -71 ‰ and for Kgwakgwe = -77 ‰. Low temperatures are inferred from the stable isotope values to have been involved in the kaolintisation, thereby eliminating hydrothermal fluids play-ing any major role. Whereas Makoro kaolin is secondary, Kgwakgwe kaolin is primary but residual.

KEYWORDS: dehydroxylation, differential thermal analysis, kaolinitisation, metakaolinite, mullitisation, X-ray powder diffraction