Effect of SiO_2/Al_2O_3 Ratio on the Thermal Reactions of Allophane

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Abstract: Differences were found in the differential thermal analysis curves and in the temperatures of new-phase development between allophanes of high (1.91 – 1.99) and low (1.47 – 1.53) SiO_2/Al_2O_3 ratios. The endothermic peak due to continuous dehydration and dehydroxylation was at higher temperatures (153 ° – 185 ° C) for allophanes with high SiO_2/Al_2O_3 ratios and at lower temperatures (148 ° – 165 ° C) for those with low SiO_2/Al_2O_3 ratios. The temperature of the exothermic peak was lower and the height affected more by the exchangeable cation content for allophanes with high ratios than for those with low ratios. New phases did not develop in allophanes having high SiO_2/Al_2O_3 ratios even after they were heated to 1000 ° C, above the temperature of the exotbermic peak. In contrast, a symptomatic development of new phases was noted in allophanes with low SiO_2/Al_2O_3 ratios at 900 ° C, below the temperature of the exothermic peak. The effect of SiO_2/Al_2O_3 ratio in the thermal behavior of allophane strongly suggests that differences in the structure are closely associated with the chemical composition of this material.

Key Words: Allophane • Dehydration • Dehydroxylation • DTA • Silica/alumina ratio • Thermal reactions

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