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DIFFERENTIAL THERMAL ANALYSIS OF HIGH-ALUMINA ALLOPHANE

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ABSTRACT

A differential thermalgram of high-alumina allophane ($SiO_2 \cdot 2Al_2O_3 \cdot 8H_2O$) shows an endothermal peak at 90°C representing loss of water; there is no evidence of OH^-. Amounts of fluxing ions were apparently insufficient to suppress a high-temperature exothermal reaction at 990°C, tentatively ascribed to formation of an Al-Si spinel.

Since publication of the article on high-alumina allophane (Snetsinger, 1967), several inquiries have been received regarding availability of differential thermal analytical data on this material. A thermalgram has subsequently been obtained, done on a scant milligram of pure allophane using a microholder unit manufactured by the Robert L. Stone Company (Tracor Instruments) of Austin, Texas; the sample was run in a combined cup-and-differential thermocouple. Referring to Figure 1, the strong endothermal peak at about 90°C probably represents loss of absorbed water, while the small exothermal effect at 340° *ca.* may be due to (1) oxidation of a very small amount of organic material or (2) oxidation of a trace of ferrous iron. Irregularities in the baseline occur above 400°C; these are due to electronic noise. The exothermal peak at 990°C is tentatively ascribed to formation of an Al-Si spinel. Amounts of ferrous iron and organic material in the high-alumina allophane are insufficient to have suppressed any dehydroxylization endotherm in the 330°C range, and no other dehydroxylization peaks occur. This is in agreement with the lack of infrared evidence for presence of hydroxyl (Snetsinger, 1967).

Presence or absence of an exothermal peak above 900°C in allpohane has been of interest to several investigators. Fieldes (1955) classified as "allophane A" ones that yielded exothermal peaks near 900°C, whereas his "allophane B" lacked such peaks. Campbell *et al.* (1968) found that the height of high-temperature exothermal peaks of allophanes increases as particle size of allophane decreases; organic matter apparently en-

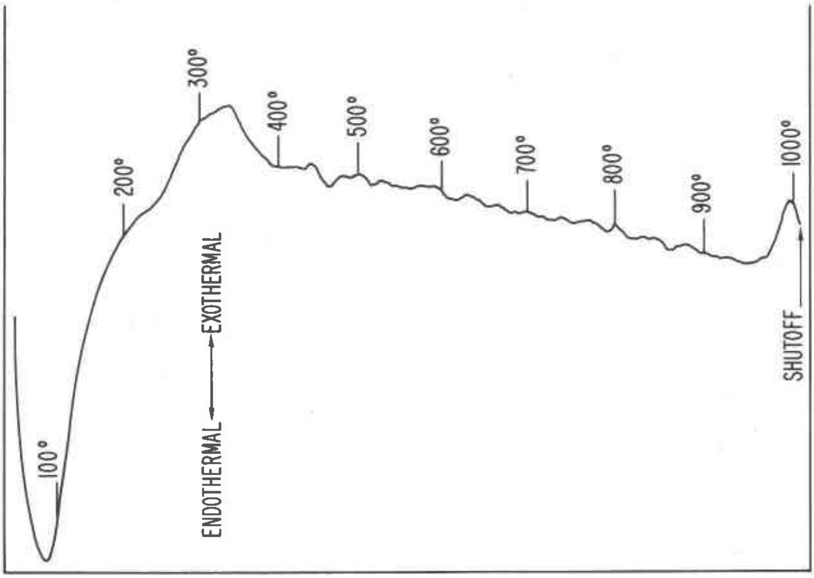

FIG. 1. Differential thermalgram of high-alumina allophane.

hances the sharpness of allophane exotherms. Gruver *et al.* (1949) found that Na compounds added to kaolinite tended to subdue or suppress the high-temperature peak. It is probable that fluxing ions, such as Na, would develop a glassy product in the Al-Si system, rather than the mineral inversion releasing exothermic energy which occurs as an Al-Si spinel is formed.

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