Further Investigations on the Rehydration Characteristics of Rectorite

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Abstract: The rehydration and rehydroxylation properties of homoionic rectorites (saturated with Ca^{2+}, Mg^{2+}, Na^{+}, or K^{+}) were further investigated. The rehydration properties of the rectorite were characterized as follows: (1) basal spacings of rehydrated materials after heating above 500 ° C changed to 22.5 Å for H_2O-complexes, 26.85 Å for ethylene glycol-complexes, and 27.65 Å for glycerol-complexes; (2) rehydrated Ca- and Mg-materials exhibited single layer hydrates at <50% RH, and rehydrated K-material showed double layer hydrates at 80% RH; (3) IR absorption spectra due to rehydrated H_2O and OH exhibited the same or very close absorption intensities and frequencies to each other; (4) DTA-TGA curves of rehydrated materials indicated that the amount of rehydrated H_2O approached about 4.2 wt. %, and about one-half of OH was rehydroxylated after heating at 800 ° C; and (5) interlayer cations of expandable layer components became non-exchangeable after heating above 500 ° C. These results suggest the following rehydration mechanism of rectorite: the interlayer cations migrate into the hexagonal holes of the SiO_4 network by thermal dehydration. The cations migrated below 400 ° C easily return to the interlayer space and their original hydrated configurations have been recovered completely on rehydration. However, those migrated above 500 ° C are fixed to the hexagonal holes but water molecules are regained in the interlayer space. Consequently, electrostatic effects of interlayer cations on formation of water molecule layers are considerably reduced.

Key Words: Electrostatic effects • Hexagonal holes • Interlayer cation • Rectorite • Rehydration mechanism • Thermal dehydration

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