
X-ray Photoelectron Spectroscopic Study of the Effect of Heating on Montmorillonite Containing Sodium and Potassium Cations

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Abstract: The effect of heating on montmorillonites containing exchangeable Na and K has been studied by X-ray photoelectron spectroscopy (XPS). The surface composition of the unheated montmorillonite was consistent with the bulk composition, but after the sample recrystallized at 1100° C, the surface abundance of Na increased, whereas that of K decreased. Because Na and K were not present in the high-temperature crystalline products, this behavior suggests that a noncrystalline material separated from the crystalline products. The Na 1s binding energy and KL₂₃L₂₃ Auger kinetic energy of montmorillonite were comparable with those of Na in typically ionic compound, such as NaCl. These electron energies became smaller and larger, respectively, on heating and approached those of feldspar (albite). The K 2p_{3/2} binding energy of montmorillonite increased slightly on heating. The K 2p_{3/2} binding energy of heated sample of montmorillonite was also comparable with that of feldspar (orthoclase). These results suggest that Na and K were incorporated into feldspar-like noncrystalline materials.

Key Words: Montmorillonite • Noncrystalline • Surface composition • Thermal treatment • X-ray photo-electron spectroscopy • X-ray powder diffraction

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