
Precise Identification of Illite/Smectite Interstratifications by X-ray Powder Diffraction

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Abstract: The thickness of the two-layer ethylene glycol complex of dioctahedral smectites varies under room conditions between 17.3 and 16.5 Å because of such factors as layer charge density, type of interlayer cation, and relative humidity. Neglecting this variability can give up to 30% error in the X-ray powder diffraction estimation of the smectite:illite ratio of the mixed-layer structures. Three methods have been developed for the interpretation of X-ray powder diffraction patterns of glycolated mixed-layer illite/smectite which take layer-spacing variability into account. The methods include a technique for quantifying the degree of layer ordering. In addition, the proposed techniques minimize the error due to the influence of domain size on positions of reflections. The experimental error can be kept below 5% or below 1% smectite layers, depending on the method applied, provided that the peak positions are measured with the accuracy of $\pm 0.02^\circ 2\theta$

Key Words: Ethylene glycol • Illite • Illite/smectite mixed layer • Interstratification • Smectite • X-ray powder diffraction

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