
Curves for the Quantification of Mica/Smectite and Chlorite/Smectite Interstratifications by X-ray Powder Diffraction

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Abstract: X-ray powder diffraction intensities for many interstratified structures of mica/smectite and chlorite/smectite were calculated by changing combinations of probabilities and transition probabilities of two component layers, respectively. The calculated d-values were plotted with P_{MS} and P_{SM} as the axes of coordinates for mica/smectites (where M is a mica layer and S is a smectite layer). These d-values were then linked into equal d-value curves on a graph. Three equal d-value diagrams ranging from 32.5 to 24.5 Å, from 15.4 to 10.25 Å, and from 3.365 to 3.08 Å were constructed for mica/smectites. Several diagrams were also constructed for mica/glycolated-smectites and chlorite/smectites using the same techniques. P_{MS} and P_{SM} values of mica/smectite producing 26.8- and 12.6- Å reflections in its X-ray powder diffraction pattern were obtained from the coordinates of the intersection of the 26.8- Å line of the first diagram and the 12.6- Å line of the second diagram. The components and stacking parameters of mica/smectites and chlorite/smectites were estimated easily using these diagrams. Interstratified mica/smectites were quantified in the air-dry and glycolated states, and chlorite/smectites in the glycolated state. Stacking parameters obtained by this method agreed well with those obtained by MacEwan's method. Stacking parameters for Reichweite (R=0) and (R= 1) structures were obtained.

Key Words: Chlorite/smectite • Ethylene glycol • Interstratification • Mica/smectite • Mixed layer quantification • X-ray powder diffraction

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