
Resolution of the Polytype Structure of Some Illitic Clay Minerals that Appear to be $1M_d$

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Abstract: Illite/smectite (I/S) and illite samples that appear to be $1M_d$ polytypes on the basis of the lack of diagnostic reflections can be resolved as partly either $1M$ or $2M_1$ or both by either vapor solvation in ethylene glycol for 40 to 80 hr at ambient temperatures or for 4 hr at 80° C, or by heating to 375° C for 2 hr. If samples are so treated, a distinct narrowing of the I/S 003/005 peak occurs and diagnostic hkl reflections are revealed. These treatments, however, do not seem to affect diagnostic polytypic peak intensities, but rather the adjacent background. We propose that the $1M_d$ term be restricted to its original definition—the disordered polytype associated with only the $1M$ ordered polytype. For illites in which disorder exists with a mixture of polytypes, the generic term Ad (disordered group A micas) should be used. Correct polytype determination of illitic material is significant because it reveals thermal history of the sediments and allows greater understanding of the depositional and diagenetic history of sedimentary basins.

Key Words: Ethylene glycol solvation • Illite • Illite/smectite • Polytype • Order-disorder • X-ray powder diffraction

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