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# Illite/Smectite from Gulf Coast Shales: A Reappraisal of Transmission Electron Microscope Images<sup>1</sup>

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**Abstract:** Transmission electron microscope (TEM) images of mixed-layer illite/smectite (I/S) from Gulf Coast shales obtained earlier by the authors have been reexamined by comparing them with the calculated images of G. D. Guthrie and D. R. Veblen. Ordered two-layer periodicity was not detected in the 1750- and 2450-m depth samples, for which X-ray powder diffraction (XRD) showed 20% and 40% illite randomly interstratified in I/S, respectively. Two-layer periodicities that occur in images of the 5500-m depth sample were inferred to reflect ordered I/S. XRD data for the same sample imply the presence of 80% illite in RI-ordered I/S. The two-layer periodicities were observed in slightly overfocused images, consistent with the image calculations of Guthrie and Veblen, with strong dark fringes inferred to correspond to smectite interlayers. Two-layer periodicities were observed only in small domains of a few of the images, consistent with the requirement of special orientation of layers, which varies continuously over a wide range. The lack of more frequent observations of ordered periodicities in TEM images may reflect the lack of the special observation conditions and chemical heterogeneity of illite and smectite layers. Ordered mixed-layering may exist in those specimens for which XRD indicates such ordering, in contrast to the previous interpretation of the authors.

**Key Words:** Illite/smectite • Lattice-fringe images • Periodicity • Transmission electron microscopy • X-ray powder diffraction

*Clays and Clay Minerals*; December 1989 v. 37; no. 6; p. 542-546; DOI: [10.1346/CCMN.1989.0370606](https://doi.org/10.1346/CCMN.1989.0370606)

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