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# Morphology of Clay Minerals in the Smectite-to-Illite Conversion Series by Scanning Electron Microscopy

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**Abstract:** The morphology of illite/smectite (I/S) from deeply buried bentonites and hydrothermally altered Tertiary volcanic rocks from Japan changes in parallel with the proportion of expandable layers in the I/S. As viewed by scanning electron microscopy, the morphologies range from the typical "cornflake," "maple leaf," or "honeycomb" habit of smectite to the typical platy or scalloped (with curled points) habit of illite. Although the changes are more subtle near either end member, at a composition of 60–70% illite layers, the morphology changes from sponge-like or cellular to platy or ribbon-like. The change of morphology at this composition correlates with a change in layer stacking from turbostratic to rotational ordering of the  $1M_d$  type. Turbostratic stacking can be thought of as randomly distributed translations of successive layers by any magnitude and in any direction. The rotationally ordered structure, which allows nearly precise juxtaposition of quasihexagonal oxygen surfaces from adjacent layers, probably permits more crystalline regularity in the  $a-b$  plane, which promotes a more plate-like or sheet-like habit.

**Key Words:** Burial diagenesis • Hydrothermal alteration • Illite/smectite • Morphology • Scanning electron microscopy • Smectite-to-illite conversion

*Clays and Clay Minerals*; April 1986 v. 34; no. 2; p. 187-197; DOI: [10.1346/CCMN.1986.0340209](https://doi.org/10.1346/CCMN.1986.0340209)

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