

Defect structures in diagenetic kaolinite-dickite to indicate its transformation mechanism: A HRTEM study

Toshihiro Kogure[1]; Atsuyuki Inoue[2]

[1] Earth and Planetary Sci., Univ Tokyo; [2] Dept. Earth Sci., Chiba Univ

Near-atomic resolution TEM imaging has been successfully applied to determine the stacking defect structures in kaolin minerals, especially in kaolinite. The specimen studied is at mid-stage of the depth-related kaolinite-to-dickite transformation in a sandstone reservoir. Although electron radiation damage is a serious obstacle, a number of high-quality images were recorded on films, in which the tetrahedral and octahedral positions in a kaolinite unit layer were clearly resolved. Electron diffraction and high-resolution imaging of dickite showed that few stacking defects exist in this polytype. On the other hand, kaolinite crystals contain high density of stacking defects. These defects or stacking disorder are formed by mixture of the two kinds of lateral interlayer shifts, approximately $-a/3$ and $a/3 + b/3$, between adjacent layers. Disorder by the coexistence of B layer and C layer, or dickite-like stacking sequence was never observed. These results provide not only an unambiguous settlement for the long controversy of the defect structures in kaolinite, but also a new clue to understand kaolinite-to-dickite transformation mechanism.