

Illite/Chlorite Mixed-Layering in the Sedimentary Rocks :
EPMA and TEM Studies

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Mixed-layering of clay minerals (smectite / illite, smectite / chlorite, vermiculite / chlorite and etc.) in sedimentary rocks has been commonly observed using powder X-ray diffraction due to the expandibility of some clay minerals (smectite and vermiculite). Illite / chlorite mixed-layering (I/C) first observed using TEM, seems to generally occur in the process of diagenesis and metamorphism (approx. 200~300°C) of a sedimentary rock.

Illite / chlorite mixed-layering has been observed using EPMA analysis, TEM lattice fringe imaging and selected area electron diffraction (SAED) in the shale from the sedimentary rock of the Jinan Basin. EPMA analyses of the illite and chlorite show that the average compositions of $K_{1.0}(Al_{3.5}Mg_{0.3}Fe_{0.2})(Si_{6.5}Al_{1.5})O_{20}(OH)_4$ & $(Fe_{6.5}Mg_{2.8}Al_{2.6}Mn_{0.1})(Si_{5.5}Al_{2.5})O_{20}(OH)_{16}$, respectively. Analyses (EPMA) (eg. $K_{0.6}(Fe_{3.9}Mg_{2.1}Al_{0.7}Ti_{0.1})(Si_{5.1}Al_{2.9})O_{20}(OH)_4$) can be interpreted as the mixing between illite and chlorite (0.36 Illite + 0.64 Chlorite) and this is directly observed by TEM lattice fringe images as random mixed-layering of 10Å illite and 14Å chlorite. Some portions of I/C mixed-layers appear as 1:1 ordered as observed from TEM lattice fringe images.