

Corrensite: A single phase or a mixed-layer phyllosilicate in the saponite-to-chlorite conversion series? A case study of Sancerre-Couy deep drill hole (France)

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ABSTRACT

Transmission electron microscopy (TEM), analytical electron microscopy (AEM), and decomposition-simulation of X-ray diffraction (XRD) patterns were used to characterize trioctahedral clay from Sancerre-Couy that had previously been considered to be a mixed-layer material of chlorite-smectite (C-S). Corrensite should not be regarded as a regular, 50:50 mixture of chlorite and smectite mixed layers but as a true phase in the thermodynamic sense with a discrete stability field and paragenetic relationships with saponite and chlorite. C-S was not found to exist; the clay is composed of saponite or mixtures of corrensite, chlorite, and minor amounts of chlorite-corrensite mixed layers (C-C). Corrensite layers from different samples have a constant AEM composition (except for Fe/Mg ratio). The *b* parameter of corrensite is not compatible with a simple association of chlorite and smectite layers. Chlorite-like and smectite-like sublayers of corrensite do not behave independently during crystal growth. Selected-area electron diffraction (SAED) patterns and decomposition of XRD profiles provide evidence of C-C mixed layers. The conversion of corrensite to chlorite occurred by two simultaneous processes: (1) intergrowth of coherently stacked layers of chlorite leading to a mixture of discrete chlorite and corrensite crystallites; and (2) chlorite-corrensite random mixed layering in the case of very intimate associations of chlorite and corrensite domains. Intergrowths largely predominate over mixed layers because the solubility between corrensite and chlorite layers is low. These C-C mixed layers cannot be considered as interstratified minerals *sensu stricto* as may be the case for the smectite-to-illite conversion series.