

Micro- and nano-characterization of Zn-clays in nonsulfide supergene ores of southern Peru

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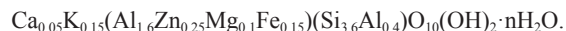
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ABSTRACT

Zn-clays are associated with several supergene nonsulfide ore deposits worldwide, where they are either the prevailing economic minerals, or minor components of the weathering-derived mineral assemblage. A TEM-HRTEM study on Zn-clays from nonsulfide ore deposits of Accha and Yanque (Peru) was carried out, to properly determine the chemistry and complex texture of these clays, not fully defined in other previous works on these (but also on other similar) deposits. The Zn-clays occurring at Accha and Yanque are constituted by a mixture of sauconite and Zn-bearing beidellite. The chemical composition of sauconite varies in a range of values, without any chemical gap, around the average composition:



Beidellites present an average composition close to stoichiometry with the addition of Zn:



The chemical composition of both sauconite and beidellite is consistent through the samples, with sauconite affected by a wider variation in composition than beidellite. The textures of Zn-bearing smectites clearly indicate that a part of these clays grew on precursory mica-like phyllosilicates, whereas another part was derived from a direct precipitation from solutions. The occurrence of a paragenesis with trioctahedral and dioctahedral smectites demonstrates that, as observed in other environments, also in a Zn-bearing system both smectite types are stable. As proved for other analogous trioctahedral-dioctahedral smectite systems (e.g., saponite-beidellite), also in the sauconite-beidellite system a chemical compositional gap exists within the series. The texture indicating a direct precipitation from solutions does not exclude that a smectite amount could be genetically related to hydrothermal fluids, even if several other characteristics (e.g., the paragenetical association with Fe-hydroxides typical of gossans) confirm the supergene origin for the bulk of the deposit.

Keywords: Sauconite, Zn-beidellite, nonsulfide zinc ore deposits, TEM-HRTEM