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New investigations on Zn-clays from Skorpion (Namibia)

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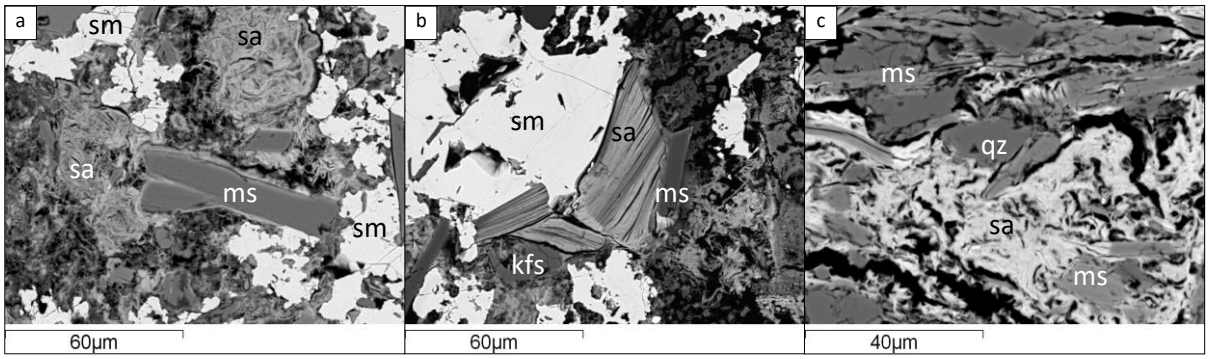
Zn-bearing clay minerals occur in several nonsulfide zinc ores, which consist of concentrations of Zn-oxidized minerals such as smithsonite, hydrozincite, hemimorphite, sauconite, and willemite [1,2]. These deposits can be genetically related to both supergene and hypogene processes [1]. Zn-clays are worldwide associated with several supergene nonsulfide ores, where they can represent an important metal source [2,3,4]. The best example is the world-class Skorpion mineralization in Namibia, which is considered so far the largest supergene nonsulfide zinc deposit in the world (original reserves of 24.6 Mt ore at 10.6% Zn).

The Skorpion deposit is hosted in Neoproterozoic rocks that are part of a volcano-sedimentary sequence within the Gariep Belt in the southern part of the country. In this deposit the trioctahedral Zn-bearing smectite, named sauconite $(0.5Ca,Na)_{0.3}Zn_3[AlSi_3O_{10}](OH)_2 \cdot 4(H_2O)$, predominates over the other Zn-oxidized minerals, mainly represented by smithsonite, hemimorphite and Zn-bearing phosphates [5,6]. Sauconite mainly occurs here in metasiliciclastic rocks, as coatings/impregnations in intergranular spaces and voids. It is considered to have been formed through the breakdown or dissolution of detrital feldspar and mica, or also by replacement of earlier deposited hemimorphite and smithsonite [6].

Petrographic and chemical analyses (energy and wavelength dispersive X-ray spectroscopy, EDS and WDS) show that the smectite-bearing samples collected for this study consist of an association of sauconite, quartz, smithsonite, K-feldspar and micas (Figure 1). Sauconite shows variable contents of Al and Zn, as well as Fe, Mg and Mn. The interlayer cations are represented by Ca and K in variable amounts. Plots of Zn/Al_{tot} vs. Si/Al_{tot} show a positive correlation; a positive trend is also observed for the correlations Zn/Al_{tot} vs. Ca/K ratios, which is consistent with charge compensation between the layers.

Figure 1: Backscattered electron micrographs of Skorpion samples SK1 (a,b) and SK3 (c), showing sauconite (sa) with smithsonite (sm), muscovite (ms), K-feldspar (kfs) and quartz (qz).



TEM-HRTEM investigations carried out on selected samples have allowed to determine the chemistry and the texture of the Zn-clays and related minerals, revealing new and complex mineral assemblages.

References:

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