

Ammonium vermiculite in schists from the Betic Cordillera (Spain)

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ABSTRACT

NH₄-bearing phases from pre-Permian schists of the Internal Zones of the Betic Cordillera (Spain) have been characterized by X-ray diffraction, differential thermal analysis and thermogravimetry, infrared spectroscopy, and transmission-analytical electron microscopy. The content and distribution of NH₄ in these phases have been estimated by combining elemental analysis of N with mineral quantification based on X-ray diffraction, whole-rock composition, and electron microprobe data. The obtained results indicate that the NH₄ content in vermiculite ranges between ~0.5 and ~1.0 (wt%), leading to terms with NH₄ > K in the interlayer. The NH₄ content is <0.30 (wt%) in biotite from underlying schists. Muscovite shows very low NH₄ contents (0.04 wt%) through the complete sequence. We interpret that, initially contained in low-grade dioctahedral mica, NH₄ was incorporated in the structure of the trioctahedral phases formed at increasing metamorphic conditions. The entry of NH₄ in the interlayer was favored in chlorite:vermiculite mixed-layered structures and transitional phases with vacancies in the A site (vermiculite) and weak cohesion between layers. NH₄ appears to favor the formation of intermediate phases instead the direct transformation of chlorite to biotite.

Keywords: Ammonium mica, biotite, Betic Cordillera, Spain, muscovite, suhailite, vermiculite