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High-temperature ammonium white mica from the Betic Cordillera (Spain)

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Abstract

High-temperature, ammonium-rich white mica has been identified for the first time in deep Paleozoic (and probably older) polymetamorphic schists from the Internal Zone of the Betic Cordillera (Spain). Ammonium-rich white mica has been characterized by optical microscopy, X-ray diffraction, infrared spectroscopy, elemental analysis, electron microprobe, and scanning and transmission electron microscopy. High-temperature, ammonium-rich white mica shows some significant chemical differences with tobelite formed in hydrothermal and low-temperature metamorphic rocks. Although the average formula, $Ca_{0.09}Na_{0.01}K_{0.15}(NH_4)_{0.75}(Al_{1.70}Ti_{0.01}Fe_{0.26}Mg_{0.13})(Si_{2.99}Al_{1.01})O_{10}(OH)_2$, is typical of a dioctahedral mica, the chemical plots reveal a clear deviation toward the trioctahedral field. Thus, the increase in Fe + Mg contents is not accompanied by the parallel increase of Si contents, characteristic of the phengitic substitution, which is characteristic of low-pressure conditions of formation. Chemical differences are also accompanied by notable differences in the optical properties, both features suggesting that the term tobelite is not appropriate for this mica. Ammonium-rich white mica relics only persist in some graphite-rich microdomains, defining the first schistosity. Textural relations indicate that this mica formed during an older pre-Alpine metamorphic episode.

Keywords: Ammonium-rich white mica, Betic Cordillera, muscovite, SEM, TEM-AEM, tobelite