



Rhenium incorporation in molybdenite: first results of a XANES study

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Rhenium (Re) is a scarce element that occurs mainly in porphyry copper-molybdenum ore deposits associated with the mineral molybdenite, MoS_2 (recognized as the main Re-carrier in Nature) but also in granite pegmatites and quartz veins as well as in volcanic gases. The unique combination of physical and chemical properties of rhenium and its alloys makes this element extremely attractive thus highly demanded. It has been applied in a great diversity of industrial fields in recent years – aerospace, electrical, chemical production (catalysts) nuclear and biomedical [1].

Molybdenite structure was determined ninety years ago [2]. It is based on the stacking of [S-Mo-S] layers with Mo^{4+} cations in prismatic coordination between two superimposed closest-packed layers of S^- anions, giving rise to polytypism [3,4] - namely 2H, hexagonal, and 3R, trigonal, the first polytype being more common in Nature but the second, incorporating higher Re-contents [5]. Between successive prismatic planar modules, additional octahedral and tetrahedral interstices are available in molybdenite which could locally accommodate ions with suitable coordination requirements, thus giving rise either to a solid-solution or to dispersed nanodomains of another phase.

With the aim of clarifying these possibilities, an X-ray absorption spectroscopy (XANES) study using synchrotron radiation was performed at the Re L_3 -edge of rhenium-rich 2H-molybdenite samples from different provenances [6]. Obtained results are developed supporting the generally accepted structural perspective that rhenium is mainly carried by molybdenite through the isomorphous replacement of Mo, rather than by the formation of dispersed Re-specific nanophase(s).

Further spectroscopic experiments are foreseen to study the incorporation of rhenium in 3R-molybdenite samples, namely from the wolframite-cassiterite mineralization of Panasqueira, northern Portugal, where the rhombohedral polytype was assigned fifty years ago [7].

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