

W-molybdenite in Silurian meta-volcanic rocks of Northern Portugal

Dias, P.A.¹, Leal Gomes, C.¹ & Guimarães, F.²

¹CIG-R – DCT, Universidade do Minho, Braga, Portugal
(*patriciasdias@gmail.com)

²LNEG – S. Mamede de Infesta, Porto, Portugal

In Silurian metavolcanic formations of Serro (Serra de Arga, Minho, Portugal) proto-tuffitic felsic rocks, have disseminated sulphides (with pyrite-pyrrotite predominant), and some rare phases such as W-molybdenite, which occur in small sized crystals ($\pm 50 \mu\text{m}$), idiomorphic (fig.1), oscillatory zoned (when viewed in EPMA – BSDE) and show a consistent compositional trend from core to rim – border enriched in Mo. W occurs in significant amount.

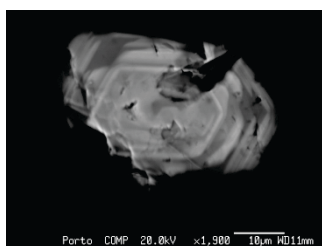


Fig. 1: EPMA - BSDE image of W-molybdenite.

Table 1: Representative core EPMA analysis of molybdenite (Fig. 1)

Fe =	0.17
S =	35.89
W =	14.79
Mo =	46.11
Total =	96.98

The W-molybdenite is considered an exceptionally rare phase formed in association to metasomatic processes: [1] showed experimentally the variability between Mo (molybdenite) and W (tungstenite) end members in the solid solution (Mo W) S₂; [2] observed W-Mo phases as scheelite hosted inclusions in replacement products in Ferbetal paradigmatic deposit; W rich-molybdenite was described by [3] in fenites of the Kola alkaline Complex.

In Serro, the presence of W-molybdenite in felsic meta-volcanics suggests peculiar conditions to the evolution in a primordial hydrothermal stage. According to the experimental data of [2] and [4], W enrichment in molybdenite is correlated with high sulfur activity during early crystallization.

The textural and compositional relationships of the observed crystals - oscillatory zoning, Mo-rich overgrowths and aspects of corrosion - suggest rebalancing with several and repeated fluctuations of oxidation degree (fO₂) in the growth medium. According to [4], Mo enrichment to the rim is accompanied by increasing fO₂.

The introduction of W in the system possibly accompanied water-interaction, concomitant with the deposition of sulphide mineralization, in a VHMS type model. The evolution to an oxygenated environment would reflect the observed deposition of vein tourmalinites (Cr-rich dravite) in tuffitic protoliths including W-molybdenite, possibly due to exhalitic remobilization. Also, it would facilitate the occurrence of molybdenite, without W content, which is observed in metafelsites, and scheelite, occurring in calcsilicate rocks and amphibolites of the same suites.

- [1] Moh, G. & Udubasa, G. (1976) *Chem. Erde*, **35**, 327-335.
 [2] Holl, R. & Weber-Diefenbach, K. (1973) *Neues Jb. Miner. Monat*, **1**, 27. [3] Barkov, A. et al. (2000) *Can. Mineral.*, **38(6)**, 1377-1385. [4] Hsu, L.C. (1977) *Econ. Geol.*, **72**, 664-670.