

Liquid Bismuth Collector as a Gold Concentration Mechanism in a Late-Variscan Gneiss Dome: Martinamor Case of Study

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The Morille-Martinamor Sn-W mining district (Salamanca, Spain) is situated within the Martinamor late-Variscan gneiss dome. This dome evolved during the late Variscan gravitational collapse, leading to the formation of various styles of Sn and W mineralization during its exhumation. These Sn and W deposits were mined, particularly during the Second World War and in the 1970s and 1980s. Historical records indicate the occurrence of gold in the tin and tungsten concentrates. Additionally, alluvial gold can be found nowadays in the district streams. Limited descriptions of gold in stibnite-bearing quartz veins have been documented in the area.

This study focuses on arsenopyrite-bearing veins from Sn and W mines, in which gold has been identified. This occurs within a Bi-Te-Au association occurring as inclusions within both arsenopyrite and quartz. Gold in these inclusions occur in form of electrum (25-50 % Ag) and is mainly related to native bismuth and Bi-sulfotellurides (such as joseite-A, ikunolite, nevskite, and an unidentified Bi-sulfotelluride), and occasionally with Bi-Ag-Pb sulfosalts and sulfides, such as sphalerite and stannite. In most cases, these inclusions exhibit droplet-like morphologies and are displayed following inclusion trails. A thermometric study was also conducted on these inclusions using the Zn/Fe partition thermometer between sphalerite and stannite and it revealed a calculated temperature range from 263 to 277°C. The melting temperature of bismuth (271°C) that falls within the estimated range of temperatures, along with the textural study suggest that the transportation of native bismuth was in the form of immiscible melt droplets in hydrothermal fluids, at least during the arsenopyrite mineralization stage. Consequently, the liquid bismuth collector model likely acted as the mechanism for gold concentration, scavenging gold from the fluids and depositing it as electrum.