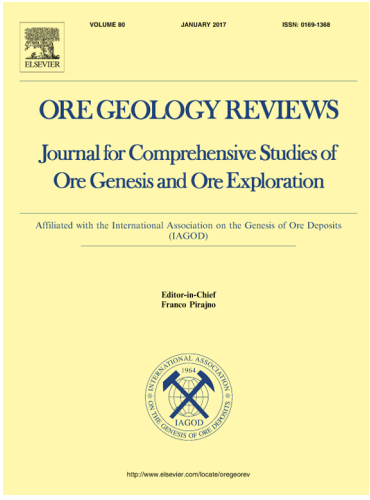

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Relationships between the occurrence of accessory Ge-minerals and sphalerite in Variscan Pb-Zn deposits of the Bossost anticlinorium, French Pyrenean Axial Zone: chemistry, microstructures and ore-deposit setting.

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Abstract

The presence of unique accessory Ge-minerals (containing up to 70 wt.% Ge) is a widespread phenomenon in Pb-Zn deposits of the Variscan Pyrenean Axial Zone (PAZ). Such a mode of occurrence is, however, rare worldwide with germanium more typically occurring as a trace component of sulfides, notably sphalerite (<3,200 ppm), or in coal deposits (<5,570 ppm). The PAZ Pb-Zn deposits are thus an excellent target to unravel the processes and key factors controlling formation of mineralization highly concentrated in Ge. Three Pb-Zn deposits are studied here: Argut-dessus; Pale Bidau; and Pale de Rase. All three are located in Late Ordovician rocks within the PAZ Bossost anticlinorium. The main mineralization (Type 2) is localized in epigenetic veins with different geometries relative to host rocks and deformation. Textural analysis of sphalerite mineralization shows evidence for both recrystallization and deformation. Sphalerite is associated with muscovite or graphite and is the unique host for the discrete Ge-minerals in the studied samples. Brunogeierite ($GeFe_2O_4$) and argutite (GeO_2) occur almost universally at sphalerite grain boundaries. Laser ablation inductively coupled plasma-mass spectrometry analysis of sphalerite and brunogeierite show that sphalerite is relatively depleted in Ge (mean ~13±3 ppm) and other trace elements such as Sb (~21±2 ppm), Cu (~153±23 ppm) and Ga (~127±10 ppm) compared to brunogeierite (29-30 wt.% Ge), which