

Progenitor Pyrite in Siliciclastic Sequences Subjacent to Intrusion-related Polymetallic Districts of the Intermontane Western U.S.; Source of Deposit Chalcogenides

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Numerous polymetallic districts in the central and eastern Great Basin and central Idaho produced Pb, Zn, Ag, Cu, and Au from skarn, replacement, vein, and disseminated deposits spatially and temporally related to Jurassic, Cretaceous, and Cenozoic granitic intrusions. Chalcogenides in these deposits have S, Pb, and Sr isotope compositions that are similar to or largely indistinguishable from those of pyrite in subjacent, multi-km thick Neoproterozoic and Paleozoic siliciclastic sequences that originally spanned hundreds of km² prior to crustal extension and compression. Sequence pyrite also contains variably elevated concentrations, relative to crust averages, of the produced metals. Forms, occurrences, and abundances (<<1 to >10% at meter scales) of sequence pyrite attest to syngenetic, diagenetic, metamorphic, and hydrothermal origins, and to very large inventories of metals and chalcogens that reside in pyrite in regionally extensive siliciclastic strata.

Whole rock $\delta^{34}\text{S}$, 206/204Pb, and 87Sr/86Sr values, +7- to +20‰, 19-21, and up to 0.738, respectively, of Mesozoic intrusions in these regions correspond spatially to those of the thick sequences (up to 8 km) of Neoproterozoic-Cambrian siliciclastic strata they penetrated. The isotope values, and aluminum saturation indices of the intrusions, 0.95 to >1, imply that the intrusions were derived from partial melting of siliciclastic sequences during flat slab subduction that persisted during much of the Mesozoic.

Pyrite in the Late Devonian-Permian Schoonover sequence of northeastern Nevada similarly has isotope values and elevated concentrations of the metals in chalcogenides of Au-Ag deposits near Mountain City and in the Jarbidge Au-Ag district that are partly to mostly in overlying Miocene Jarbidge Rhyolite. We propose that Mesozoic and Cenozoic magmas hydrolytically decomposed pyrite in Neoproterozoic and late Paleozoic siliciclastic sequences, and provided thermal gradients that enabled fluid transport of metals and chalcogens to proximal and distal deposit sites in adjacent and overlying rocks.