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Trace Element Contents in Sulfides from Porphyry Cu-Au(\pm Mo) Deposits, Central Srednogorie Zone, Bulgaria

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Porphyry copper systems are of great economic importance as main suppliers of Cu, Mo, Au, and Re but also because they contain metals like Ag, Pb, Zn, Pd, Bi, Te, Se, most of them referred to as critical metals. In the present study we have applied a combination of SEM-EDS and laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) techniques to measure metal contents in sulfide minerals from the Elatsite and Assarel porphyry Cu-Au(\pm Mo) deposits (PCDs). These are two of the biggest operating open-pit mines in Bulgaria, situated in the Central Srednogorie Zone as part of the Late Cretaceous Apuseni-Banat-Timok magmatic and metallogenic belt.

Special attention was paid to the content of critical metals in pyrite, as this mineral is part of all mineral associations in both deposits, but concentrates mainly in waste products during flotation. Our data shows that pyrite is a major host of Au and many other elements including Se, Co, Ni, Ag, Cu, Pb, Sb, Te, and Tl. Elevated Se content is established in pyrite from both deposits up to 1,116 ppm (in Elatsite). In some zonal pyrite crystals from the late quartz-pyrite veins from Elatsite deposit, cobalt varies from a few ppm up to 1.6%. The zones with elevated Co content also have higher Ni (up to 0.5%) and Se (up to 530 ppm) contents. Chalcopyrite from Elatsite and galena from Assarel also reveal high Se content, up to 412 ppm and 2 to 3% Se, respectively. Consequently, ore minerals that are considered waste products for both deposits are major repositories and carriers of some critical metals.

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