Comparative study on the trace element contents of sulfides from the Neogene and Laramian porphyry copper deposits from Romania

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Laser ablation inductively coupled plasma mass spectrometry was used to investigate the concentrations of trace elements (Mn, Co, Ni, Cu, Zn, Ge, As, Se, Ag, Cd, In, Sn, Sb, Te, Au, Pb, Bi) in more than 150 grains of pyrite, chalcopyrite and bornite from porphyry type deposits in Romania. The investigated samples are from the Neogene Subprovince of the Apuseni Mountains (Roşia Poieni, Bucium-Tarniţa, Colnic, Rovina, Valea Morii and Bolcana deposits) and from the Banatitic Subprovince of the Southern Charpatians (Moldova Nouă deposit). The results show that Bi, Ag, Se and Te are preferentially concentrated in bornite (403-1684 ppm, 114-301 ppm, 291-833 ppm and up to 65 ppm, repectively), and chalcopyrite (0.27-57 ppm, 5.92-63 ppm, 171-453 ppm and up to 39 ppm, respectively). In pyrite, Cu is the main trace element (140-1604 ppm), followed by Co (53-1344 ppm), As (18-685 ppm) and Se (24-702 ppm). At Colnic, the mean Au concentration was 1 ppm in chalcopyrite and 7.4 ppm in pyrite, while in the other deposits Au is < 1 ppm both in copper sulfides and in pyrite. Although most analyzed spots indicate the presence of trace elements as atoms trapped in the sulfide mineral lattice, several measurements suggest that Pb, Zn, Au, Te, Bi, Se, Cd, Co and Ni are also present in micro/nanoinclusions both in copper sulfides and in pyrite. The wide range of contents, the irregular distribution of trace elements and high abundance of mineral inclusions reflect rapid precipitation of minerals in non-equilibrum conditions, repetitive dissolution and re-crystallization. The determined values indicate an enrichment in Co, Se, Ag, Cd, Te and Au in the sulfides of the Neogene deposits from the Apuseni Mountains, while in the Laramian Moldova Nouă deposit, the sulfide minerals are richer in As, Sb, In, Sn, Ge and Tl.

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