

Metallic mineral deposits of the Bor metallogenic zone s.s. (Republic of Serbia)

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The Alpine metallogenic unit in the southern sector of the Carpatho-Balkan arc is represented by two metallogenic zones: the Oravita-Krepoljin zone in the west, and the Bor-Srednegorie zone in the central part. They were formed at the front of the Jurassic-Cretaceous oceanic slab, subducted from the Vardar zone beneath the Eurasian plate. The mineralization is associated mainly with late Upper Cretaceous calc-alkaline igneous activity.

The Bor-Srednjegorie zone extends from Lilieci-Linbcova and Bozovici in the north (Romania), over Bor (Serbia) to Burgas (Bulgaria), extending through the Black sea and Tracia into Turkey. It is over 600 km long and from 0.5 km in the north to 80 km wide in its eastern sector.

In Serbia, the Bor-Srednegorie metallogenic zone (Bor metallogenic zone s.s.) is associated with a rift-graben environment, where volcano-intrusive complexes were developed, with a predominance of polygenic volcanic rocks of central type development.

Copper and gold are the dominant metals in the Bor metallogenic zone. Current estimated measured and indicated mineral resources (reserves of the A, B and C₁ category according to the Serbian classification) are 1090 Mt @ 0.38% Cu, 0.14 g/t Au (4145 Mt Cu, 153 t Au). They are accompanied by Fe (sulphide, oxide) and Pb-Zn, Mo, sporadically PGE, and exceptionally Mn. The most prominent types of metallic mineral deposits of the Bor ore zone are:

- Porphyry copper/molybdenum deposits /PCM/ (subtypes: PCM hosted by multistage composite plutonic granitoid complex /type: Valja Strž/, PCM related to high-level dyke swarms above plutonic body /type: Veliki Krivelj, subtype: Cerovo-Cementacija/; PCM associated with high sulphidation massive sulphides (subvolcanic type) /type: Bor- Borska reka/ and PCM related to an initial rift fault structure /type: Majdanpek/);
- Hydrothermal cupriferous pyrite deposits of massive sulphide and stockwork-impregnation type of mineralization (type: Choka Dulkan, Tilva Mika etc.)
- Hydrothermal massive base-metal sulphide deposits (type: Tenka);
- Hydrothermal massive Cu-Pb-Zn-Au sulphide deposits (type: Choka Marin);
- Hydrothermal vein deposits (Cu, Pb-Zn and Au) (type: Krakuj Bugaresku);
- Skarn deposits (Fe-oxides, Pb-Zn, Cu) (type: Valja Saka, Potaj Cuka) and
- Epithermal gold deposits both of high and low sulphidation type (Kuruga, Zlace etc.).

Major ore elements of the Bor ore zone are Cu, Au, Mo, Fe (Py) ± Pb-Zn. Trace elements are Se, PGE, Ag, Cd (recoverable) and W, Sn, Bi, Sb, As, (Ba) (unrecoverable). The principal associations of elements are classified as follows:

- Cu, Au, Mo ± Ag, PGE (porphyry copper);
- Cu, Pb/Zn, Fe (Py), Au/Ag ± Se, Bi, Sb (massive sulphide);
- Cu, Au, Fe (Py), As ± W, Sn, Se, Sb (cupriferous massive sulphide/replacement);
- Fe-S (massive pyrite);
- Cu, Fe (Py) ± Mo, Bi, W (skarn).

Ore deposits are found within 16 ore fields, and are grouped into 5 ore districts. They belong to different morphostructural types of ore mineralization and display a diversity in ore paragenesis, associations of minerals and elements.