БЛАГОРОДНЫЕ И РЕДКИЕ МЕТАЛЛЫ В БОРНИТОВЫХ РУДАХ
КОЛЧЕДАННЫХ МЕСТОРОЖДЕНИЙ УРАЛА

V. P. MOLOSHAG, I. V. VIKENTIEV, T. YA. GULYAEVA, S. G. TESALINA. PRECIOUS
AND RARE METALS IN BORNITE ORES OF THE URALS MASSIVE SULFIDE ORE DEPOSITS

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620151, Екатеринбург, Почтовый пер., 7

Investigation of mineralogy and geochemistry of bornite ores was carried out for Gayskoye, Molodezhnoye, Aleksandrinskoye, Karabashskoye and the IIIrd International deposits where massive sulfide ores are enriched in gold, silver germanium, gallium and tin. Genesis of bornite-bearing ores is related to metamorphism process, its temperatures and the sulfur fugacity values have been determined with help of electrum-sphalerite geothermometer. Minimum values of these parameters were estimated by the ratio of abundant S₂ to Cu₂S in composition of digenite. During the fahlore (formerly, gray copper ore) subfacies of metamorphism the bornite mineralization took place at 270—360°C and sulfur fugacity 10⁻⁸—10⁻¹³ atm. There have been found as the high-copper sulfides: chalcocite Cu₂S, digenite Cu₁.₈S, anilite Cu₁.₇₅S, so the low-copper sulfides: spioncopite Cu₁.₄S, yarrowite Cu₁.₁₂S and covellite CuS. Chalcocite, digenite and, possibly, anilite have the hypogene genesis, the low-copper sulfides have been generated in oxidation conditions. There are characterized, in the paper, compositions of bornite, fahlore, native gold, copper and silver sulfides: stromeyerite, jalpaite, mackinstyrite, so as germanium- and tin-bearing sulfides: stannoidite Cu₈Fe₄(Fe²⁺, Zn²⁺)Sn₄S₁₂, mawsonite Cu₆Fe₂SnS₈, germanite Cu₂₀(Ge,V, As)₄Fe₄S₃₂ and renierite Cu₂₀(Zn₂₋ₓCuₓ)(Ge₄₋ₓAsₓ)Fe₈S₃₂.