



Mineralogical and geochemical features of promising types of gold mineralization in the western Altai-Sayany folded region (Russia)

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The western Altai-Sayany folded region is one of the oldest mining regions of Russia. Typical gold deposits are quartz-veins and skarns, which formation is associated with intrusion of island-arc and collision granitoids. Due to the fact that the traditional gold ore base of the region has already been largely worked out, the necessity of prospecting for new gold deposits has arisen. On the basis of available data, one may state that the outlook for the development of gold-mining industry of the Altai-Sayany region is concerned with gold mineralization in weathering crusts, epithermal gold-silver, gold-porphyry and gold-sulfide formations. The total gold resource potential of these object types is estimated by us at the level of 2000 t.

The gold mineralization of epithermal gold-silver formation is confined to Early-Middle Devonian volcanic-plutonic belt. Here, gold-bearing zones of beresitization, argillization, sulfidization and silicification are discovered among volcanites. Maximum contents of noble metals are found in quartz-sulfide veins among sulfidized (arsenic pyrite, pyrite, galenite, sphalerite and fahlore, etc.) and silicified volcanic and subvolcanic rocks. Ore zones are marked by anomalously high content of Au, Ag, Pb, Zn, As, Sb, Hg not only in bedrocks, but also in haloes of dispersion in loose deposits.

Gold-sulfide mineralization in terrigenous carbonaceous strata is confined to Late Riphean, Early Cambrian and Devonian metamorphosed complexes. These rocks were formed in the marginal sea basins. Metamorphism and repeated tectono-magmatic activation in the region resulted in redistribution and accumulation of gold. Gold-ore zones are marked by intensive silicification and sulfidization and are characterized mostly by occurrences of multiple generations of pyrite and arsenic pyrite. Gold occurs both in free state and in sulphides. Geochemistry of gold-ore zones can be characterized by associated elevated content of As, Ag, Sb, Cu, Hg.

Gold-sulfide mineralization in terrigenous-carbonate strata (Karlina type) is confined to Vendian and Late Devonian-Carboniferous carbonaceous dolomite and limestone. Formation of such epithermal mineralization is associated with Mesozoic Siberian plume evolution. Gold mineralization is confined to major tectonic zones, it is accompanied by listwanite, jasperoid and argillized rock as well as barite, polymetal and mercury mineralization. Geochemistry of gold-ore zones can be characterized by associated elevated content of As, Ag, Sb, Pb, Zn, Hg, Tl.

Gold-porphyrific mineralization is confined to the areas of distribution of small massifs and dyke fields composed of diorite, granitoid, monzonite, and syenitoid. It is significant that gold is closely associated with copper and molybdenum reflecting general regularities in formation of porphyry orogenic systems. Gold-ore zones are accompanied by kaolinitization, silicification and sulfidization. The most widely distributed minerals in ore zones are chalcopyrite, bornite, pyrite, molybdenite, fahlores etc.

Gold in crusts of weathering is found in Cretaceous-Paleogene clay and clay-rubby deposits distributed predominantly among Early Cambrian gold-bearing sulfidized vulcanogenic-sedimentary rocks. Average content of gold in the crusts of weathering is 0.5-1.5 g/t. The gold is of high fineness, with little silver admixture, predominantly free, recoverable by gravity separation, fine in some areas, and associated with clay particles.