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Epithermal gold mineralization of the Kurama volcanogenic province (Uzbekistan): conditions of the formation and mineralogical-geochemical style

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The Kurama volcanogenic province is a South-Eastern part of the Chatkal-Kurama ridge of Uzbekistan and it is an Eastern termination of the Valerianov-Beltau-Kurama volcano-plutonic belt, that is a part of a global Ural-Tien-Shan-Mongol-Okhotsky structure. The Chatkal-Kurama region is unique in terms of large industrial deposits of Au, Ag, Cu-Mo, Pb-Zn, Sb, Hg, U and other elements.

A wide development of upper Paleozoic andesite volcanism, development of diverse volcano-structures and orthogonal system of faults are typical for the Kurama province. Recently peculiarities of a geological structure of the province are explained by the presence of mantle plume and hot spots. Consecutive formation of giant and large deposits of Au-Cu-Mo (Kalmakyr, Dalnee), Au-Ag (Kochbulak, Kyzylalmasay) is connected with these hot spots. The Kalmakyr deposit is a classic copper-porphyry deposit associated with a stockwork of granodyorite-porphyries. The age of mineralization is ∼315Ma (SHRIMP). A number of researchers associate gold-bearing property of Cu-Mo mineralization with telescoping of following gold mineralization which is determined as epithermal, volcanogenic-hydrothermal. The age of gold mineralization is 3-1 (300-280Ma) and it is comparable with its age in other ore districts of Uzbekistan – Nurata and Kyzylkum. Gold mineralization of the Kurama province is clearly differed into three types, which are typical for all volcanogenic provinces of the world: 1) gold-arsenic, pyrite-arsenopyrite type with dispersed nanogold, localized in sublatitudinal negative structures (grabens). This type is presented by arsenic pyrite, fine-crystalline acicular arsenopyrite, hersdorffite, loellingite, nickeline. 2) gold-telluric, telluride-polymetallic type with high standard gold in volcanic structures with explosive breccias. Major ore minerals are pyrite, galena, chalcopyrite, sphalerite, tetrahedrite, in the matrix of which, there are micro- nanoassemblages of gold (1000-700 ‰ with various tellurides and selenides: calaverite, petzite, altaite, sylvanite, montbrayite, nagyagite, hessite, tellurantimony, coloradoite, tetradymite, laitakarite, nevskite, guanajuatite. 3) gold-silver, selenide-sulphosalt type. This type is located in positive structures (horsts, cupolas). Electrum (AuAg) and kustelite (AuAg3) with polybasite, stephanite, pyrargyrite, petrovskaite, naumannite, clausthalite, kervellite, allargentum, silver segregate in arsenic pyrite, galena, chalcopyrite, acanthite, freibergite. Gold-silver type tends to localize in nearer-surface conditions than gold-telluric. In fact, it is considered to be epithermal. Gold-telluric and gold-arsenic types form at epi-, mesothermal conditions. Replacement of gold-silver mineralization by gold-telluric one is observed with depth on slightly eroded deposits (Kyzylalmasay). Early gold-arsenic type is separated from other types by the period of dyke injection, and gold-telluric and gold-silver are attached to submeridional faults. The clusters formed in locations of intersections of these faults with sublatitudinal grabens determine a position of the deposits and centers of volcanogenic activity (subvolcanoes, extrusions).

Non-central-concentric zoning of location of different types of mineralization is observed in the Kurama province: Cu-Mo→Pb-Zn→Au-As→Au-Te→Au-Ag→Pb-Ag→Cu-Bi→Hg→CaF2→U. It is obvious that metallogeny of the Kurama province is determined by a long-term development of mantle plume, upper Paleozoic magmatism and volcanism.