THE GENESIS OF GOLD MINERALIZATION IN CARBONATE ROCKS IN SOUTH UZBEKISTAN

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In the process of studying gold mineralization in carbonate rocks of South Uzbekistan, thermobarogeochemical methods for determining the genesis of the rare metal type of the gold mineralization, and the establishment of the possibility of using the aforementioned methods in exploration were used for the first time. The oldest rocks of the section are the siliceous-terrigenous deposits of Silurian-Devonian age. The main rock type in the region is Devonian limestone. The main fault zone, observed mainly in the northwest direction, dips to the northeast at 75 degrees, and is restricted to the limestones, which are considerably crushed and cataclastic. The gold mineralisation is temporally related to cataclasis in the southern part of the fault zone, and also to the carbonate breccia in the vein calcite,which adopts pyrites and cinnabar. The presence of isolated grains of antimonite are rare. The most wide spread mineral of the studied section is calcite, which forms numerous veins of brown and grey breccias. Calcite is the main mineral of the veins, sometimes containing rare disseminations of cinnabar. The vein contains semi-transparent prominent crystal varieties of calcite, which are similar in their physical characteristics (the degree of transparency) to Iceland spar.

Calcite has different generations which may be divided using gas-liquid inclusions. The following morphological groups of inclusions were observed in calcite:

1. Approximately negative-crystal shaped inclusions, the axis of symmetry in the negative crystals usually coincides with that of the host mineral. For the majority of these inclusions, the sides of the main rhombohedron (1011), the sharp rhombohedron (0221), hexagonal prism of the first origin (0110), the plane rhombohedron (0112) and scalenohedron are typical. The inclusions represent the following combinations of the simple forms in the negative crystals: the plane rhombohedron (0112) and prism (1010), scalenohedron (2131), the main rhombohedron (0111) and prism and the others.
2. The group of half-sided inclusions.
3. The wedge-shaped and triangular forms of inclusions.
4. Tubular and needle-shaped inclusions, which are situated parallel to the ribs of the host crystal.
5. Inclusions of irregular, sometimes-whimsical shapes: mace-sort, tower-sort, sickle and disk-like. The shape of these inclusions is explained by the spiral dislocations of the sides of inclusion during their formation.
6. Isometrical inclusions with very irregular, edges, the shape of which is caused, apparently, by rapid crystallization, or, on conversely, by the dissolution of the vacuole walls by aggressive (unsaturated) solutions preserved in the inclusions.
7. Simple inclusions with a clear rectilinearly-cranked curved contour.The majority of all inclusions in calcites of all studied formations of the region (the calcites of the grey and brown breccias, calcite veins with cinnabar and gold, semi-transparent calcite from vein formations, nests and poit-impregnations) are two-phase with the the following liquid to gas ratios:L95:G5; L90:G10; L85:G15; L80:G20; L75:G25; L70:G30. Additionally, in the inclusions in vein calcites which contain gold and cinnabar, cubic halita is also present. In the inclusions discovered in semi-transparent calcite from the point-impregnations in the nests of pole-like calcite, the presence of the carbonic acid is also determined. The homogenization of the inclusions consistently occur in liquid phase under temperatures 250-212-208-176-142-126-113-100-75°C. On the basis of thermometrical investigations the following evolution of the hydrothermal fluids is determined: the hydrothermal solutions, which took part in the formation of the productive mineral association in the carbonate breccias have the temperatures 212-126°C, calcite veins with gold and cinnabar precipitated from hydrothermal solutions at temperatures of 142-113°C; semi-transparent calcite was formed during the third stage of hydrothermal activity at temperatures of 113-75°C. The investigation of the inclusion composition in calcites, made by the method of aqueous extracts, indicated Cl^-, HCO_3^-, Ca^{2+}, Mg^{2+}. The solutions are weakly mineralized (Em= 5.95-3.17). The gas composition of the inclusions in calcite was determined during the crushing in the ball vacuum mill: CO_2 1.4%, N_2 84.5%. The investigations permitted us to define the character of mineralising solutions, which took part in the formation of the studied gold-bearing deposit.