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Geological Environment and Skarn Minerogenesis (after the example of skarn-scheelite deposits of the Western Uzbekistan)

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The Western Uzbekistan territory relates to the western part of the South Tien Shan geosyncline folding system. Numerous skarn-scheelite, apogranitic, plutonogenic-stratiformic genetic types of tungsten deposits and ore manifestations forming on the contact of carbonate-terrigenous series of the Paleozoic period and genetic connected with granitoid plutons of the Late Hercinian age and of mezo-hypabyssal facies are distributed here. They were formed with specific typomorphic minerals.

Metasedimentary host rocks composition, magmatism, tectonic regime and physico-chemical conditions of deposit forming (T, P, pH etc.) form a part of geological environment conception in the our sense.

Based on this idea there were distinguished five types of geological environments or environments of minerogenesis on which founded the new classification of tungsten deposits within the region, viz.:

1) calc- magnesian- carbonate environment with polyformation calc- magnesian- skarn-scheelite (±molybdenite) deposits (Ingichka, Jachton etc.);
2) calc-carbonate with monoformation calc-skarn-scheelite-molybdenite deposits with sulfides (Koytash);
3) magnesian-carbonate with monoformation magnesian-molybdenite deposits (Tym, Kalta etc.);
4) granitoid environment with deposits of apogranite type (Sarytau etc.);
5)magnesian-calc-terrigenous environment where plutonogenic -straiformic type of deposits were formed (Sarytau etc.).

Criteria of prognostication have been worked out.

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Calcium and Strontium-bearing gorceixite as a replacement product in fossil bones from a Cretaceous sandstone in South Brazil.

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Two fragments of fossil bones were collected in a sandstone of the Adamantina Formation, Bauru Group (Late Cretaceous) in a road side cut about 2 km south of the town of Santo Inácio, State of Paraná, Brazil. They probably belonged to reptiles that lived in broad fluvial spreading flats developed in semi-arid climate.

The two whitish bones mesure 28 cm (the larger) and 5 cm (the smaler) in length. They are hollow inside and present an elliptical cross section. In spite of a crumby consistency they still preserve perfect internal and external bone structure. Thus it is concluded that they were not transported for long distances and did not undergo deformation after being buried. The bones are built by a dense shapeless crystalline substance which, under the microscope, exhibit wavy extinction and very low birefringence. It is known that in saurius fossil bones, rod-shaped apatite crystals are arranged paralell to collagen fibrils. These are the initial arrangement attributable to the Santo Inácio bones.

Thin sections show in detail, concentric lamellae, harvesian canals and fibrous layers, the same found in the present-day bones. Therefore it is probable that, in a submicroscopic scale, gorceixite substituted for apatite rods or fibers, in a quiet, undisturbed medium.

In one longitudinal thin-section it was possible to stablish the gorceixite orientation in the bones. Here, two neighboring lamellae show opposite (+) and (-) elongations. "Flash" figures obtained in both lamellae indicated an uniaxial mineral, the optic axis of which paralleled the length of the lamella with (+) elongation and crisscrossed the length of the lamella with (-) elongation. Accordingly, the bone gorceixite can be conceived as an aggregate of submicroscopic parallel fibers of a (+) uniaxial (or biaxial with small 2V) mineral with (+) elongation.

The refractive indexes measured by the immersion method Na-D-line at 20° C using Cargille liquids controled with an Abbé refractomer vary slightly among the fragments but the birefringence remains constant and very low: ng: 1.6180 up to 1.6230, np: 1.6152 up to 1.6200, ng-np: 0.0028 up to 0.0030.

Adopting for the Santo Inácio gorceixite a (pseudo) rhombohedral space group R-3m and the following X-ray powder diffraction data: 101 d: 5711(75); 110,114 d: 3501(51); 113 d: 2.976 (100); 006, 202 d: 2.855 (12); 024 d: 2.468 (8); 205, 107 +d:2.253 (22); 122,116 d: 2.213 (28); 214, 018+ d:2.020 (9); 303,125 d: 1.903 (35);220,208 d: 1.751 (21); 217,119 d: 1.674 (4); 1010, 306 d: 1.645 (4); 315, 0111 d:1.508 (4); 0210, 226 +d: 1.490 (11), the unit cell parameters are: a (Å): 6.994 (5) and c (Å): 17.11 (1).

The electron microprobe analysis (average of 5 points) gave results: BaO: 20.09; PbO: 1.52; SrO: 4.77; CaO: 1.29; Na_2O: 0.04; K_2O: 0.27; Al_2O_3: 33.14; Ce_2O_3: 1.28; Fe_2O_3: 0.42; P_2O_5:26.89; SO_3: 0.94; H_2O (by difference): 8.48.

It was not found any sign of movement and/or hydrothermalism in the site of the bone findings. However recent works have been associating to a Late Cretaceous magmatism, a hydrothermal event which would explain intensive silicification along a NE-SW belt adjacent to the bone findings.

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JIAODONG GRANITOIDS AND GOLD MINERALIZATION

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Gold production in Jiaodong started from 598 AD, reached 89.5% of the whole country in 1078 AD and is now still on the topmost in China. The late Archaean Jiaodong group as the primary source rock of Jiaodong gold deposits consists in the main of auriferous basic to intermediate-acidic metavolcanics forming the magnetite type of crystalline basement. Its magnetite content reaches 8239 g/t, 1782 g/t and 254 g/t respectively in biotite leptite, plagioclase amphibolite and biotite plagioclase gneiss while the inhomogeneous gold content in its mafic rock-forming minerals like garnet, hornblende and biotite may reach 11098 ppm, 7861 ppm and 8786 ppm respectively. The Mesozoic granitoids generated from partial remelting of the Jiaodong group are of the I—type magnetite—series, showing inheritance petrochemically, mineralogically and geochemically from the Jiaodong group and acting as active intermediary source rock of Jiaodong gold deposits.

In the gold-hosting granitoids, the magnetite content reaches 2881 g/t, the gold contents in quartz, plagioclase and microcline reaches 4800 ppm, 20500 ppm and 24200 ppm respectively. The hornblende shows very strong Fe^{3+} Mossbauer spectrum while the biotites are above the NB and close to the MH oxygen buffer line with log $fo_2 > -15.5$ Zircon and albite crystallize under high water vapor in the temperature range of 700-600℃ and below 515℃ respectively. Other volatiles like P_2O_5, CO_2, F, Cl are also high. The content of whole-rock alkali is >7.8 wt% with the euhedral largest phenocryst of mesomicrocline in the medium-grained porphyritic granitoids reaches 25cm×7.5cm×4.0cm in size. High abundance of gold, high content of alkali and volatiles, high oxygen fugacity as well as strong postmagmatic dynamometamorphism in the shear zone and extensive hydrothermal alteration favour the formation of thickly distributed mineralization with large and even superlarge gold deposits while thin supercrustal cover, strong upthrust tectonism, good accessibility and other natural conditions favour the prospecting, exploration and exploitation not only in the past and at present but will also play important role in the near future. The three major gold-hosting granitoids in Jiaodong are generated in 170.6±2.3Ma(J_3), 148.4±2.3Ma (J_3) and 129.2±1.9Ma(K_1) with three gold mineralization stages at 130.3±14.2Ma)K_1), 121.3±0.6Ma(K_1)and 100.74±3.6Ma(K_1) respectively. Jiaodong gold deposits generated from relevant calc-alkaline granitoids constitute an important gold province of the E. circum-Pacific minerogenetic belt on the mobile margin of Asian continental plate. In this portion of the gold province investigations of more than 20 gold deposits have been made during the late 15 years, including more than 100 mineralogical maps by means of 24 mineralogical parameters. In prospecting for deep-seated orebodies and surrounding deposits mineralogical mapping has been proved to be rather simple, convenient, rapid, economic and effective.

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FUCHSITE, MARIPOSITE, CLASSIFICATION OF POTASSIC DIOCTOHEDRAL Cr—Al MICA SUBGROUP AND THEIR TYPOMORPHISM

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Both fuchsites and mariposites from China belong to the potassic dioctahedral mica subgroup of $2M_1$ structure with 0.54—0.98 occupancy by K in the 12—coordinated site and 1.88—2.16 occupancy by Al, Cr together with a little Mg, Fe in the 6—coordinated site. Their octahedral Al/(Fe^{2+}+Mg)ratio is up to 57.58 with mean of 12.55. The tetrahedral Si/Al ratios are 3.00—3.30 for muscovites (Ernst, 1963), 3.49—6.02 for fuchsites and 8.09—29.77 for mariposites from Jiaodong respectively, displaying the continuity of the series from muscovite through fuchsite to mariposite. The data given above show that fuchsite is not varietal of muscovite and mariposite is not varietal of phengite and therefore not identical with chromian muscovite and chromian phengite respectively.

According to the occupancy by Cr in the dioctahedral site of the potassic Cr—Al mica subgroup with the tetrahedral Si/Al ratio less than 7 of that of the phengite, the isomorphous series may be divided into four species, marked by $Cr_{0-0.5}$, $Cr_{0.5-1}$, $Cr_{1-1.5}$ and $Cr_{1.5-2}$, corresponding to the Cr_2O_3 content of 0—8.5 wt%, 8.5—17.0 wt%, 17.0—25.5 wt% and 25.5—34.0 wt%. The first three are proposed to be termed fuchsite, treloarite and outokumpuite respectively. In this study fuchsite is retained for the "low Cr fuchsite" as before and the other two are named after the discoverer and the discovered locality, while the fourth is left to future discovery and discussion. As to those referred to mariposites with tetrahedral Si/Al ratios more than 7 of that of the phengite, further classification is also left to the future due to want of available sufficient data. Barian fuchsites from Hemlo, SW Greenland and S. India may be ascribed to varietal subspecies of the newly proposed subgroup in question.

In this subgroup Cr_2O_3 content is typomorphic. All fuchsites and mariposites from gold deposits hosted in the Mesozoic granitoids and the late Archaean metamorphics in Jiaodong are the lowest in Cr content. So are also fuchsites from the early Archaean quartzites in E. Hebei and the late Archaean greenstone belt in E. Liaoning but they are much lower in Si content than those from granitoids. Fuchsites from the Archaean gold deposit as in Hemlo and metasomatics of ultramafics and mafics as in Canada and China are relatively higher in Cr content, but still much lower than those from the massive sulfides as in Finish Karelia.