Paper Number: 2992

Granites in the Khentei Batholith, Northern Mongolia, and related mineralization

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The Khentei Batholith represents the Early Mesozoic magmatic activity (230-190 Ma) in the Central Asian Orogenic Belt (CAOB). The core uplifted part of batholith is composed of large number of plutons of granodiorite to leucogranite and gabbro - granite suites, and in the periphery rimmed by rifting zones with alkaline and rare-metal granite plutons. Mineralization is mainly associated with rare metal granites. The Early Mesozoic rare metal granites form multiphase intrusions, and by mineralogy and geochemistry correspond to geochemical type of Li-F granites [1]. It is expressed by elevated concentrations of F, Li, Rb, Cs, Sn, Be, Ta, Pb and reducing content of Sr, Ba, Zn, Zr, Th and U during formation of multiphase intrusions. Rare-metal Li-F granites produce small domal intrusions composed of microcline-albite, amazonite-albite and albite-lepidolite granites.

The geochemical data confirm the magmatic genesis of rare-metal Li-F granites [2]. However this process of fractional crystallization and magma differentiation is terminated with formation of albitite, microclinite and muscovite greisens. The isotope characteristics of granites are in agreement with the model of formation of the initial granitic melts at the lover continental crust, partial melting of biotite-bearing granulites due to the rise of the asthenospheric mantle plume. Composition and isotope-geochemical features of supposed source correspond to the Neoproterozoic crust in Northern Mongolia with the model age T2DM = 1000-1300 Ma.

Miarolic pegmatites, Sn-W veins, Sn-W greisens, lepidolite-albite granites and albitites with Sn-Ta-Nb mineralization are main type of ore mineralization. Miarolitic pegmatites are associated with the main phase of porphyritic coarse-grained biotite granites. Pegmatites are composed of quartz, microcline, fluorite, topaz, beryl, mica (biotite, muscovite and zinnwaldite), and accessory minerals. A number of Sn-W mineralized prospects and small deposits are associated with the second stage of muscovite-biotite medium-grained granites. Ore-bearing veins are small, rarely are up to 1 m thick and 100 m long. Tourmaline and silica alterations are common. Greisen alteration is characteristic for granites of last stage. There are several different types of greisens, but the most common are quartz-tourmaline, quartz-topaz and quartz-muscovite types. Zinnwaldite-bearing greisen (zwitter) was described by Kovalenko et al. [2]. Ta and Nb mineralization is associated with lepidolite-albite granites and albitites in the Urt Gozgor and Buural Khangai areas. Lepidolite-albite granites stretches along the faults for up to 3.5 km and are up to 800 m thick. Series of metasomatic rocks: lepidolite albitites, amazonitie albitites and quartz albitites (albite-lepidolite greisens) contain the Sn-Ta-Nb mineralization. Unidirectional solidification textures (UST) are common. The model of rare metal magma origin is proposed.

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