

Geochemical Characteristics and Spectrometric Prospecting in the Muscovite-bearing Pegmatites and Granites, Southeastern Aswan, Egypt

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ABSTRACT

Rare metal mineralization of Sn, Nb, Ta and W are encountered at Gabal Dihmit area (GDA), southern Aswan. The mineralization is related to muscovite granites and their pegmatite derivations. The pegmatites are grouped into three types according to their main mineral assemblages: K-feldspar-muscovite-tourmaline, K-feldspar-albite-muscovite and albite-K-feldspar-lepidolite veins. Petrogenetic studies indicate that Sn and Nb-Ta mineralization extend from the late magmatic stage to the pegmatite and hydrothermal stages of the GD suite. The topaz-lepidolite granite is dominantly composed of albite, lepidolite and quartz with topaz, K-feldspar and amblygonite. The accessory minerals are zircon, monzonite, pollucite, columbite-tantalite, microcline and Ta-rich cassiterite. Phemocrysts of quartz, topaz and K-feldspar contain abundant inclusions of albite laths and occasional lepidolite crystals along growth zones (snowball texture), indicating simultaneous crystallization from a subsolvus residual magma. The origin of pegmatites is attributed to extreme differentiation by fractional crystallization of a granitic magma. The economic potential of rare metals evaluated in geochemical discrimination diagrams. Accordingly, some pegmatites are not only highly differentiated in terms of alkalies but are also promising targets for small-scale of Ta and some degree for Sn. The pegmatites also provides the first example of Fe-Mn and Nb-Ta fractionation in successive generations of granites to cassiterite-bearing pegmatites, which perfectly exhibit mimics fractionation trends established for primary columbite-tantalite in the corresponding categories of pegmatites.