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High Potassium Alkaline Magmatic Rocks of the Central Aldan Ore District (South Yakutia) and Associated Gold and Gold-Uranium Mineralization

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Systematic study of high potassium alkaline igneous rocks in the Central Aldan ore district and associated gold mineralization began in the 1920-30ies with the work of V.N. Zverev, A.P. Bakhvalov, Yu.A. Bilibin, R.V. Nifontov, V.I. Serpukhov and others. However, the peak of investigations took place during the 1940-60ies, when Yu.A. Bilibin (1941, 1958) distinguished the so-called "*petrographic province of alkaline rocks*" in the Aldan Shield based on the detailed mineralogical, petrographic and petrochemical studies of high-K alkaline rocks in individual stocks: Tommot, Yllymakh, Yakokut, Yukhukhta, Inaglino, Ryabinovy and others. Subsequently, this fact played a decisive role in prediction and discovery of new gold targets in the region, associated with the emplacement and long-term evolution of high-K Mesozoic alkaline intrusions. In the early stages of exploration, the area was considered promising only for its placer potential, although some researchers (V.N. Zverev, Yu.A. Bilibin) predicted here primary gold deposits, which was confirmed in 1927 by the discovery of gold veins of the Lebedinoe deposit.

Over the whole history of development of its gold resources, the Central Aldan ore district produced about 1,000 t of gold. Currently, deposits of the Kuranakh group, Ryabinovoe, Podgolechnoe, and Lunnoe are being mined. The deposits of the Elkon ore cluster, unique in their gold and uranium reserves, as well as the Gora Rudnaya porphyry gold deposit are awaiting development.

Currently, reserves of the Kuranakh group are estimated at 170 t with gold grade of 1.43 g/t. Over the whole development history, the deposit produced about 200 t. All fields occur on the boundary of Cambrian carbonate and Jurassic terrigenous deposits of the sedimentary cover. Magmatism is represented by Mesozoic series of lamprophyre dykes, less often by stocks and sills of syenite porphyry.

Gora Rudnaya and Ryabinovoe deposits are presented by vein-disseminated mineralization in syenite and monzonite stocks and are associated with gumbaitic and beresitic alteration types. Predicted resources in the Gora Rudnaya deposit are 151 t with an average grade of 2.7 g/t. Reserves in the Ryabinovoe deposit are 21 t of gold and 42.6 t of silver.

Tabular orebodies in the Lebedinskoe ore field are characterized by a clear stratigraphic confinement to the Vendian-Cambrian carbonate deposits of the platform cover in the area of intense development of high-K Mesozoic rocks. Gold content in the ores of Lebedinskoe varies from 5-10 g/t (in cross-cutting veins) to 70-80 g/t (in stratabound deposits), and the average is 15 g/t. Silver content is on average 20-40 g/t (to 95 g/t).

The Elkon group of deposits is associated with long-lived faults in the rocks of the Archean-Proterozoic basement rejuvenated during the Mesozoic tectonic-magmatic activation and is one of the largest

uranium districts in Russia. It has a uranium reserve of 344 kt with a grade of 0.147% U. Most of the known Au-U deposits are confined to the Yuzhnaya, Severnaya, Agdinskaya, Fedorovskaya shear zones. Gold reserves estimated only for the Yuzhnaya shear zone vary from 130 to 180 t with grades of 1.5-2.5 g/t Au.

