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Archaean multiphase Porosozero sanukitoid pluton of the Kola region: petrological, geochronological and geochemical data

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The Porosozero sanukitoid intrusion is located in the greenstone belt of the Kolmozero-Voronja, north-eastern part Fennoscandian (Baltic) Shield. The Porosozero multiphase pluton was formed as a result of the 4 magmatic phases during the period ca. 60 million years. The main phase is represented by a differentiated series of gabbro-diorite - quartz monzodiorite - granodiorite – granite. The zircon TIMS ages of granodiorite and quartz monzodiorites are 2733±6 Ma and 2734±4 Ma, respectively. The second phase is composed of leucogranites formed during intrusion of the residual melt portion from intracrustal source. The age of zircon from leucogranite is 2712±6 Ma. The third phase is represented by the lamprophyre dykes with the zircon age 2680±8 Ma. The late pegmatite veins were formed during the fourth final phase.
The volume relationships between the gabbro-diorite, quartz monzodiorites, granodiorites and granites are 5:55:27:13, respectively. The medium weighted composition of the initial melt, calculated from the rock compositions of the first phase is andesite (wt.%): SiO_2 = 61.53, TiO_2 = 0.58, $Al2O_3$ = 15.74, $Fe2O_3$ = 3.75, FeO = 3.07, MnO = 0.10, MgO = 3.06, CaO = 5.83, Na2O = 3.78, K2O = 2.37. The compositional variation is the result of fractional crystallization. The last magmas may have experienced some crustal contamination.
All rocks of the first phase are enriched in Ba (500-800 ppm), Sr (450-700 ppm), K2O (1.8-3.2 wt. %), P2O5 (0.15-0.35), LREE [(La/Yb)N=15-23] and contain high concentrations of Cr (150-400 ppm) and Ni (60-140 ppm), possess high mg# values (0.45-0.65), and show a negative Nb-Ta anomaly. Sm-Nd isotopic data for sanukitoids indicate their formation from a mantle source enriched in LILE and LREE with εNd (2740) = +1.02 - +0.36, T(DM)=2.9-2.8 Ga. The Porosozero polyphasic pluton is similar to worldwide Archaean and Phanerozoic magmatic sanukitoide series. The Porosozero pluton formation is determined by the processes of mantle-crust interaction in suprasubduction conditions within the active continental margins. The high content of Ag and Au in rocks Porosozero pluton provides a general perspective for precious metals.