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The KL01 anomaly – a new kimberlite pipe in Arkhangelsk region (NW Russia)?

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Russia is the one of a major diamond producer, responsible for around 30% of the world's diamond output each year. Most of its diamond mines occur in Siberian Craton within the boundary of semi-autonomous Sakha Republic. Arkhangelsk region, particularly, the Arkhangelsk Diamondiferous Province (ADP), located on the North of European part of Russia is the other major diamond potential area that hosts two large diamond deposits: Lomonosov (operated by Alrosa) and V. Grib (operated by Otkritie Holding) mines. Since the time of V.Grib pipe finding at 1996, no new diamondiferous kimberlite pipes have been discovered within the ADP. However, in 2017, after 2-years of intensively sampling and geophysical works, the Proex Service geology team localized the perspective for diamond exploration area in the southern part of ADP, within the which, a pipe-like anomaly (KL01) was identified. The magmatic pipe was sampled up to 300 m in a depth by the deep drilling programme. The pipe is composed by reddish-brown sandstones that contain up to 40 vol. % of magmatic material admixture. Such type of sandstones, i.e. tuff-sandstones, is the typical component of crater parts of the majority of the ADP kimberlite pipes. The magmatic admixture is presented by strongly altered green colored minerals up to 2 cm in size and xenoliths up to 11 cm in size. The geochemical modelling results show that the sandstones contain up to 20 % of kimberlitic type admixture. The positive correlation of Ni with Sr, Nb, La, Th, as well as positive correlation of Ni, Cr and MgO with the depth of the samples also evidence to kimberlitic type of admixture. Furthermore, the 55 grains of kimberlite indicator minerals (KIMs), including 30 pyropes, 12 picroilmenites (with MgO 10 – 17 wt. %), 8 chromites (with $Cr2O_3$ 50 – 63 wt. %), and 5 Cr-diopsides, were recovered from -1+0.5 mm size fraction of heavy mineral concentrates from the 200 kg crushed tuff-sandstones. All the KIMs have primary magmatic type of surfaces. Pyropes are lherzolitic (G9) with $Cr2O_3$ content of 1.5 – 11.4 wt. %. Pyropes with high-chromium content (5 – 11 wt. %) match the field of diamond associated pyropes from the V. Grib kimberlite pipe (Shchukina et al., 2017), and have weakly-sinusoidal REE profiles. The Ni content in pyropes varies within the range of 11 – 96 ppm that corresponds to the following P-T parameters (Ryan et al., 1996): 600 - 1280°C and 28 – 78 kbar. The data show that the studied tuff-sandstones can represent the crater part of a new kimberlite pipe that potentially can host diamonds.
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