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Petrology of the Northern Anabar alkaline-ultramafic rocks (the Siberian Craton, Russia) and the role of metasomatized lithospheric mantle in their genesis

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The southeastern margin of the Anabar shield (the Siberian Craton) in Mesozoic was characterized by intense alkaline-ultramafic (include diamondiferous kimberlite) magmatism. This zone is located within the Archean-Proterozoic Hapchan terrane and includes several fields of alkaline-ultramafic rocks that formed during three main episodes (Zaytsev and Smelov, 2010; Sun et al., 2014): Late Triassic (235-205 Ma), Middle-Late Jurassic (171-149 Ma), Cretaceous (105 Ma). Following the revised classification scheme of Tappe et al. (2005), the alkaline-ultramafic rocks of the Anabar region were identified, correspondingly, as 1) Late Triassic aillikites, damtjernites, and orangeites; 2) Middle-Late Jurassic silicocarbonatites and 3) Cretaceous carbonatites.
According to mineralogical, geochemical and isotopic (Sm-Nd, Rb-Sr) data on the alkaline-ultramafic rocks of the Anabar region, the following scheme of the mantle source evolution is suggested:
1). Ascent of the asthenospheric (or plume) material to the base of the lithospheric mantle containing numerous carbonate- and phlogopite-rich veins in Late Triassic led to the generation of orangeite and aillikite magmas;
2). Evolution of aillikite magmas during their ascent and interaction with the surrounding lithospheric mantle (e.g. mantle-rock assimilation and/or melt differentiation) resulted in the accumulation of Mg-Si components in alkaline-ultramafic magmas and was accompanied by a change in liquidus minerals (from apatite-carbonate to olivine and Ca-silicate). Exsolution of carbonate-rich fluid at this stage was responsible for the formation of damtjernite magmas.
3). The tectonothermal activation within the Anabar region in Jurassic was marked by the generation of silicocarbonatitic magmas. Their geochemical composition suggests decreasing abundance of phlogopite-rich veins in the lithospheric mantle source.
4). In Cretaceous, the alkaline-ultramafic magmatism shifted into the central part of the Hapchan terrane where produced several carbonatite pipes and dykes. Their geochemical composition indicates the predominance of the carbonate component in the source region and a decrease of the thickness of the lithospheric mantle.
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