

EGU21-9122

<https://doi.org/10.5194/egusphere-egu21-9122>

EGU General Assembly 2021

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Sapphire-bearing magmatic rocks as indicators of the continental collision tectonic events: a case study of Uralian orogenic belt

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Gem corundum (mainly ruby) occurrences are commonly associated with orogenic belts. Corundum deposits of metamorphic origin are known as robust indicators of continent-continent collision tectonic events. Although sapphire-bearing primary magmatic deposits are also found in orogenic belts, their link to continental collision process remains poorly understood. Here we show that primary igneous blue sapphire occurrences in the Ilmenogorsky alkaline complex of Ilmen Mountains in Uralian orogenic belt are indicative of the continent-continent collision processes among Kazakhstania, Laurussia, and Siberia 330 – 250 Ma ago (Sorokina et al. 2017).

The results of geochemical, mineralogical, and geochronological research of corundum syenite pegmatites demonstrate that *in situ* primary magmatic corundum-bearing mineral assemblages can be used to evaluate the formation conditions and the time constraints of magmatic processes imposed by tectonic activity during orogenesis.

Thus, the corundum syenite pegmatites have recorded a multistage evolution of the Ilmenogorsky complex. They crystallized at temperatures of 700 – 750°C at 275 and 295 Ma ago (*in situ* LA-ICP-MS U-Pb zircon dating) within the timeframe of the continental collision of the Uralian orogeny. The isotopic signatures show a geochemical link of these deposits to nepheline syenites – miaskites of the main igneous body in Ilmenogorsky complex. While, some corundum syenite-pegmatites express the metamorphic overprint at temperatures of 700 – 780°C occurred 249 ± 2Ma ago (TISM Rb-Sr isotopy) during limited post-collision stretching period in the area of Ilmenogorsky complex (Sorokina et al. 2021). Hence, these results imply that primary magmatic corundum deposits can be used as an important indicator of continental collision events.

References:

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