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Evidence of interaction of the subducting slab with iron-saturated transition zone of the mantle

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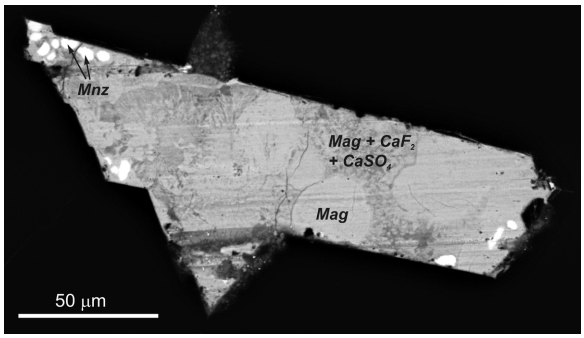

We demonstrate the presence of diamonds from the transition zone in placers deposits in the northeastern area of Siberian craton. Diamond ISTD-72 contains inclusions in which the replacement of chromite by iron oxides is observed. One inclusions contain only iron oxides and fragments of diamonds. The diamond XLS-82 contains a large inclusion (200mm) with a heterogeneous composition (Fig. 1). The compositional maps show areas consisting of magnetite and areas where together with magnetite there are phases containing Ca, F, Mn, S. In addition, the inclusion contain monazite crystals ranging in size from 5 to 8 μm. The FIB/TEM technique used to study inclusions. Areas of inclusions in diamond ISTD-72 composed of iron oxides are nanocrystalline aggregates consisting of magnetite and nanoscale diamonds. Magnetite nanocrystals are usually idiomorphic and have a size 10 – 100 nm. The composite inclusion in diamond XLS-82 is a mixture of nanocrystalline magnetite, CaF_2 and anhydrite. CaF_2 usually has a cubic structure, but in some cases, an orthorhombic polymorph has been identified. The structural phase transition of cubic CaF_2 to the orthorhombic modification was established at pressures of 8-10 GPa [1]. Taking into account the fact that magnetite is present in the studied inclusions in the form of a nano-crystalline aggregate, it can be concluded that diamonds captured the oxidized iron melt. We believe that the nanocrystalline magnetite aggregate indicates the decomposition of the high-pressure modification of iron oxide (Fe_5O_6) to Fe_3O_4 +FeO [2]. It is important to note that Fe_5O_6 is stable within the forsterite+diamond stability field [3]. Taking into account the available experimental data, it can be concluded that diamonds with inclusions of oxidized iron crystallized in the pressure range of 9-15 GPa. Nanocrystalline inclusions in diamonds indicate the interaction of the subducting slab with iron-saturated transition zone of the mantle.

[1] Cui *et al.* (2009) *Comput. Mater. Sci.* **47**, 41–45.
[2] Hikosaka *et al.* (2019) *Am. Min.* **104**, 1356-1359.
[3] Myhill *et al.* (2016) *Contrib. Mineral. Petrol.* **171**, 51