Isotope and mineralogical study of diamonds from Northwestern Russia

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We have studied diamond from two kimberlite fields of the Arkhangelsk diamondiferous province: Lomonosov (6 pipes) and Grib (1 pipe). Study of morphology (size, shape, preservation, defects, color and microstructure of surface) as well as analysis of the inner structure, physical properties, carbon isotope composition, chemistry and mineralogy of inclusion were carried out.

Carbon isotope composition of the studied diamond crystals varies from -2.79 to -9.61‰ for the Grib kimberlite pipe and up to -21‰ in case of Lomonosov field. Mineral paragenesis is of the peridotitic type for the Grib and mixed peridotitic-eclogitic for the Lomonosov field. This is in agreement with the well known relationship between carbon isotope composition and the paragenesis of mineral inclusions in diamonds [1]. A-form nitrogen concentrations vary from 20 to 1474 at. ppm and from 1 to 1417 at. ppm for B-form. The aggregated form of nitrogen overreachs 40%. Diamonds are characterized by high concentration of platelets (up to 31.8 st.un.) and double modal distribution of hydrogen. Average parameters of diamond crystallization are: for the Gribs pipe T=1100-1250°C, P=45 kbar, and for the Lomonosov field: T=1075-1150^{0}C, P=43 kbar.

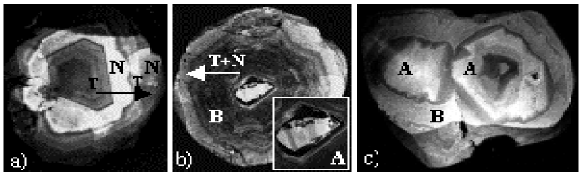

Figure 1: Inner structure of diamond crystals (by CCL): tangential (T) and normal (N) mechanisms of multistage crystallization; discreetness of diamond origin – first (A) and second (B) generation of crystals.

We distinguish two diamond generations among the studied diamonds. They differ in shape, carbon isotope composition, inner structure, content of N, H defects and platelets. We interpret the obtained results in terms of different conditions for diamond genesis in both fields.

[1] Galimov (1991) *GCA* **35**, 1697-1708.

Temporal geochemical evolution of Neogene volcanism in northern Baja California: Insights on the origin of post-subduction magnesian andesites

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New field, major and trace element and whole rock K-Ar data on the Neogene volcanic fields of Baja California Peninsula show that, around 11 Ma, the calc-alkaline activity was replaced by magnesian andesite volcanism, showing paroxysmal activities between 8.5 and 3.8 Ma in Jaraguay, and 3.7 to 1.8 Ma in San Borja. The characteristic geochemical signature of the magnesian andesite suite is consistent with an origin through dehydration melting of pargasite-rich lithospheric mantle at depths of ca. 80 km. Our modelling results suggest that this amphibole was formed during metasomatic interactions between the mantle wedge and slab melts percolating through it, during the opening of an asthenospheric window beneath the Peninsula between 12.5 and 8 Ma. The temporal and geochemical evolution of magnesian andesite suite is studied using a set of 98 dated samples ranging in age from Miocene to Pleistocene. It is marked by an increase of incompatible elements concentrated in pargasitic amphibole (Sr, Ba, K, light REE), which were released in large amounts during dehydration melting, and conversely by the progressive exhaustion in Rb and Th hosted in small quantities by this mineral. The progressive temporal depletion in Y and HREE of the suite is consistent with the increase of the amount of residual garnet in the lithospheric mantle as a product of the dehydration melting reaction. This melting occurred at minimal temperatures of 1050-1075°C, consistent with a high thermal flux in the mantle wedge during the opening of an asthenospheric window following ridge-trench collision, as well as during the subsequent “no-slab” regime which followed the sinking of the Farallon plate.