Geophysical Research Abstracts
Vol. 13, EGU2011-3226, 2011
EGU General Assembly 2011

Melting textures and microdiamonds preserved in graphite pseudomorphs from the Beni Bousera peridotite massif, Morocco

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Large cuboïd graphite aggregates (millimetre scale) occurring in garnet pyroxenite layers from the Beni Bousera peridotite massif (Rifean belt, northern Morocco) have been interpreted, for more than 25 years, as pseudomorphs after diamond.
In this study, over thirty of these graphite aggregates were manually extracted from a garnet pyroxenite layer in order to investigate their micro-inclusion content combining scanning electron microscopy, micro-Raman spectroscopy and cathodoluminescence. Beside large composite clinopyroxene–orthopyroxene–garnet inclusions (ca. 500 μm across), silicate films with a thickness of a few micrometres ubiquitously occur, intercalated between large graphite flakes. They are of basaltic composition and are interpreted as partial melts formed by in situ melting of the large composite inclusions and, possibly, of the host pyroxenite, during the Beni Bousera massif uplift. In addition, various solid inclusions composed of chlorides, sulphates and carbonates are found to be evenly distributed over both core and coat of the graphite aggregates. Diamond crystals, 0.5 to 2 μm in size, were also observed in several aggregates, apparently included in large graphite flakes, and were characterized using cathodoluminescence and Raman micro-spectroscopies. They are interpreted as relics of large mantle-stage diamonds, now heavily graphitized. This finding confirms earlier propositions that the graphite aggregates in Beni Bousera and Ronda garnet pyroxenites are pseudomorphs after diamond and raises questions on the kinetics of graphitization.

Key-words: graphite, diamond, orogenic peridotite, garnet pyroxenite, Beni Bousera, silicate melt films, partial melting, cathodoluminescence, Raman spectroscopy.