

Detection of a REE-rich, F- and P-bearing fluid component in superdeep diamonds from Kankan (Guinea).

Frank E. Brenker¹, Laszlo Vincze², Bart Vekemans², Anja Szymanski¹, Wout De Nolf³, Koen Janssens³, Thomas Stachel⁴, Jeff Harris^{1,5}

¹Geoscience Institute / Mineralogy, Johann-Wolfgang-Goethe University, Frankfurt/Main, Germany, ²Department of Analytical chemistry, Ghent University, Gent, Belgium, ³Centre for Micro- and Trace Analysis - Department of Chemistry, Antwerp University, Antwerp, Belgium, ⁴Department of Earth and Atmospheric Sciences, University of Alberta, Edmonton, Alberta, T6G 2E3, Canada, ⁵Division of Earth Sciences, University of Glasgow, Glasgow G12 8QQ, Scotland, UK (f.brenker@em.uni-frankfurt.de)

Synchrotron based confocal X-ray fluorescence analyses were performed at the ESRF (European Synchrotron Radiation Facility, Grenoble) on a set of Kankan diamonds (Vekemans et al, 2004, Vincze et al., 2004). Of special interest was a large Kankan diamond containing many Ca-Si-O rich inclusions (KK200). Investigations applying Raman spectroscopy yield CaSiO_3 walsstromite, CaSi_2O_5 titanite and larnite ($\text{beta-Ca}_2\text{SiO}_4$) as inclusion paragenesis. The varying proportions of the respected phases indicate a depth of origin within the two phase field of larnite+ CaSi_2O_5 titanite between 300 and 360km (Brenker et al., 2005).

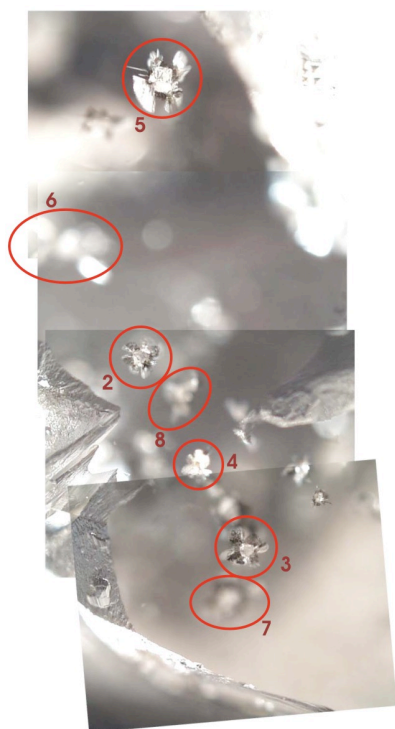


Fig. 1 Inclusions in diamond KK200. No. #3 is studied in greater detail in this work

narrow fractures show that contrary to our expectation the fractures are actually filled with material. The fracture filling shows close similarities in trace element composition to the mineral inclusions, in addition to being generally enriched in REE. The former existence of a fluid or melt is required to transport material into these elongated fractures. This interpretation is further confirmed by X-ray diffraction measurements which indicate the presence of florencite and La-cerite crystals within the fracture fills.

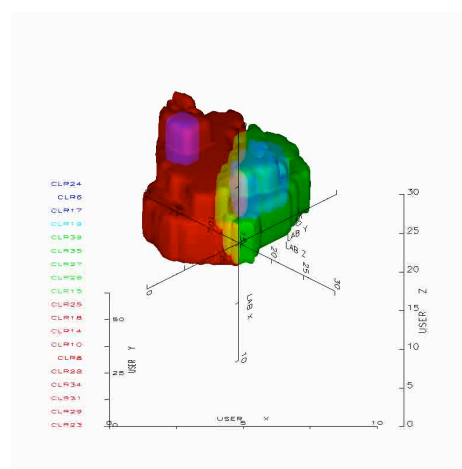
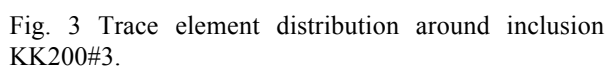


Fig. 2 Trace element distribution of a polyphase inclusion (KK200#3). The detected phases are walsstromite, larnite and other Ca-Si-O-rich mineral phases

The most likely interpretation is the entrapment of a volatile component during diamond growth, probably dissolved at high pressure within the solid inclusion phases. During uplift of the diamonds and associated pressure release this volatile content is expelled from the solid inclusion as a fluid and penetrates into the newly forming fractures.

Detailed trace element tomography of several cubo-octahedral inclusions and their surrounding



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