The 24th Global-COE International Frontier Seminar

January 11th 2012, 16:30-18:00

The meeting room (#486) 4F, Science Research Bldg 1

ALLUVIAL DIAMONDS FROM NORTH-EAST OF SIBERIAN PLATFORM: EVIDENCE FOR FORMATION IN SUBDUCTION ENVIRONMENT

Prof. V.S. Shatsky

Institute of Mineralogy and Petrology, Novosibirsk, Russia

Novosibirsk State University,Novosibirsk, Russia

The alluvial diamonds from placers of North-East of Siberian platform was studied through characterization of their external and internal morphologies, impurity defects, mineral and fluid/melt inclusions. Diamond morphologies included dodecahedroids, cuboids, octahedron/ dodecahedroids and round forms. The internal structure and nitrogen aggregation variations testify that significant proportion of round diamonds were formed in two generation, separated by long time period. More than one hundred diamonds were polished to expose their mineral inclusions. In total 218 inclusions were exposed, among with 139 eclogite (garnet, omphacitic clinopyroxene, coesite, K-feldspar, rutile, corundum) and 79 peridotite (olivine, pyrope garnet, clinopyroxene, ortopyroxene, chromite) paragenesis. Inclusions of eclogite suite are predominant (64%).A pyropic garnet inclusions plot within the harzburgite (n=5) and lerzholite (n=2) fields. Elevated Na_2O (0.1-0.3 wt%) is typical of eclogitic garnets. Inclusions of majoritic garnet of ultrabasic and eclogite parageneses were identified in two round diamonds. According to the experimental data, the pressure at which majoritic garnet of harzburgitic paragenesis was formed should exceed 7.5 GPa, whereas the formation of majoritic garnets of eclogitic paragenesis required pressure exceeding 13 GPa. Diamonds show a range in carbon isotopic composition from -26 to -1‰ d^{13}C (n=22) with a bimodal distribution. Peridotitic diamonds are restricted to values between -9.6 and -1,0‰ whereas eclogitic diamonds have wide range of isotopic composition (-4.5 to -26‰). Ion microprobe analyses of C isotopes composition reveal large variation within single stone (up to 16‰ in δ^{13}C). The presence of majoritic garnets in the studied diamonds suggests that a part of the placer diamonds was formed under sublithospheric conditions. The isotopic composition of the studied diamonds containing majoritic garnets provides evidence for the mantle source of carbon. At the same time, peculiarities in the garnet composition may provide evidence for crystallization of diamonds in subducted rocks of the Earth's crust. Multiple inclusions from diamonds and isotopic composition of carbon are consistent with a mixing model in which they result from the interaction of slab-derived melt/fluid with surrounding mantle.

Contact: T. Irifune
irifune@dpc.ehime-u.ac.jp
http://www.ehime-u.ac.jp/~grc

EHIME UNIVERSITY GRC GEODYNAMICS RESEARCH CENTER

Global COE DEEP EARTH MINERALOGY EHIME UNIVERSITY JASRI, UNIV.TOKYO, SBU

The 24th Global-COE International Frontier Seminar

January 11th 2012, 16:30-18:00

The meeting room (#486) 4F, Science Research Bldg 1

EVIDENCE FOR EVOLUTION OF GROWTH MEDIA IN SUPERDEEP DIAMONDS FROM SAO-LUIS (BRASIL)

Dr. D.A. Zedgenizov

Institute of Mineralogy and Petrology, Novosibirsk, Russia

Diamonds from Sao-Luis (Brazil) are known to be originated from the depths of transition zone and lower mantle. In this study we consider some aspects of the composition and evolution of growth media for diamonds from this locality.CL imaging has revealed the complex growth history for most diamonds, reflecting their formation in several stages. Nitrogen content in an individual diamonds varies from several to 500 ppm. An apparent tendency for the 3107 cm^{-1} peak intensity to increase with increasing the nitrogen content gives support to the idea that the conditions favouring the incorporation of nitrogen in these diamonds might also favour the incorporation of hydrogen. Specific feature of diamonds from Sao-Luis is extremely high nitrogen aggregation state (90-100 %B1). The set of luminescence centers N3, H3, H4, 490.7 is typical for all diamonds. Radiation-induced centers with peaks at 536 and 576 nm are often observed. The total range of carbon isotope composition in diamonds studied by SIMS makes up from -3.3 to -20.3 ‰ of d^{13}C. Some diamonds show local variations of d^{13}C between different growth zones (up to 7 ‰).The dominant inclusions in studied diamonds are CaSi-perovskite and AlSi-phases. MgSi- and CaTi-perovskites, ferropericlase, native iron, coesite and zircon have also been found. Raman shift of coesite peak show high residual pressure (>3 GPa at ambient temperature). FTIR study of some microinclusion-bearing diamonds showed that water and carbonates are not major components of diamond-forming fluids. LA-ICPMS bulk composition has significant enrichment in Ca, Fe and Al and strong depletion in Mg. Trace elements show general enrichment in Ti and V and depletion in Sr, LREE and Ni. Most probable source for such environments might be fluids from deeply subducted rocks of metasomatized oceanic lithosphere.

Contact: T. Irifune
irifune@dpc.ehime-u.ac.jp
http://www.ehime-u.ac.jp/~grc