Inclusions of diamonds from Hunan, the Yangtze Craton and their revealing for forming environment

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Diamond and its internal inclusions are considered to be effective tools for providing insights into deep process and geochemistry environment in mantle[1], as well as tracing placer diamonds' host rocks and forming environment. Hunan placer diamonds from Ruan river basin in the Yangtze craton is one of the three commercial mining areas of diamonds, but the only one area currently producing diamonds in China, with which there is still no conclusive findings on the origin and host rocks.

Micro laser raman spectroscopy, EPMA, LA-ICPMS are applied to perform analyses on gem type diamonds from Hunan. Detailed inclusion observations show that there are nearly equal proportions of peridotic and ecologitic paragenesis in Hunan diamonds, and these two parageneses can be found coexisting in a single diamond. Peridotic paragenesis comprises of olivine, the commonest mineral, and enstatite, hedenbergite, pyrope, etc, while ecologitic paragenesis consists of almandine-pyrope as a commonest mineral, omphacite, coesite, kyanite, anatase and rutile, etc. The ecologitic paragenesis, their mineral compositions (e.g. omphacite with characteristics of low MgO 7.34%-7.60% , $Mg^{\#}$62-69 , enriched in Na_2O 5.94%-6.28% and K_2O 0.24%-0.26% , Na/(Na+Ca)=0.473-0.489), and diagnostic kyanite of protogenic inclusion, seem to indicate they have much affinity with B type ecologite[2], implying the occurrence of subduction of ancient crust prior to diamond growth. Thermobarometer of olivine inclusions in Hunan diamonds inferred a forming temperature and pressure of ranging between 1109-1237°Cand 4.05-5.83GPa, respectively, roughly corresponding to a depth of 130-190 km.

In conclusion, Hunan placer diamonds may be formed in a mantle environment with participation of crustal substances, closely correlated to B-type ecologite generated by subduction of ancient crust slab, implying there existed recycled crustal substances in mantle beneath Yangtze craton.

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