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Nanoinclusions of phase Egg $AlSiO_3(OH)$, in superdeep diamonds from Juina (Brazil): evidence for subduction of crustal components to earth's mantle transition zone

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There is evidence for a possible deep subduction of crustal materials from (i) ultrahigh-pressure metamorphic terranes related to continental collisions, (ii) studies of geochemical reservoirs of basalts and (iii) experimental synthesis and investigation of typical crustal minerals at extreme pressures and temperatures.

Here, we present additional evidence for deep subduction of crustal material: nanoinclusions in kimberlitic diamonds. Most of the mineral inclusions in kimberlitic diamonds belong to mantle sections of the Earth's interior. Inclusions such as ferropericlase, Ca-Si-perovskite, Mg-Si-perovskite, perovskite, tetragonal almandine-pyrope phase (TAPP) are indicators for a deep seated origin of the diamonds up to 1700 km (..... Kaminsky, Zakharchenko et al. 2001). First evidence of traces of crustal materials was found in diamond from Guaniamo (Venezuela), containing coesite with crustal oxygen isotope signature, which is in the range of $\delta^{18}O$ = 10.2 to 16.9 ‰ ,.....()()(Schulze, Harte et al. 2003).

We present the first finding of an hydrous aluminum silicate phase Egg ($AlSiO_3(OH)$) in alluvial diamonds from Juina (Mato Grosso, Brazil) using transmission electron microscopy (TEM) and Raman spectroscopy. The finding of this particular hydrous aluminum silicate phase indicates that continental material was subducted to the man-

tle Transition zone. Phase Egg is present in diamond in several larger inclusions (a few hundred micron in size) as nanometer-sized, idiomorphic crystals (20 – 30 nm). Phase Egg is associated with a small volume fraction of stishovite and a significant amount of pore space, which was originally filled with a fluid or gas. The gas or fluid has been released during TEM sample preparation. The finding of phase Egg proves the existence of an Al-phase in the lower mantle and Transition zone environment. The presence of OH-groups in phase Egg strongly supports the idea of subduction processes reaching the depth of Transition zone and lower mantle.

References

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