Diamond inclusions: OH in NAMs

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Since the pioneering work of G. Rossman and D. Bell in the late 80s [e.g., 1], on OH in Nominally Anhydrous Minerals (NAMs) from the mantle, the 'water budget' and distribution within the Earth's interior has become a major topic for debate. Eclogite and peridotite mantle xenoliths derived from kimberlites, are the host rocks for diamonds, and are composed of similar minerals to those identified as inclusions within diamonds; but the important question remains; are the diamond-forming fluids also responsible for the crystallization of the diverse suite of mineral inclusions within the diamonds - are they syngenetic? Even the use of diamondiferous eclogites [2], with different ages between the host versus the secondary diamonds [3-4], presents ambiguities. However, the mineral inclusions in diamonds, olivine, pyroxene, and garnet, are the best representatives of the upper-mantle, and their volatile contents shed light on the long-held assumption of syngenesis between diamonds and their inclusions. We present a detailed data-set on water contents for a chemically diverse set of mineral inclusions in diamonds from the Siberian Craton. This study was reinforced by recent detection of water in ultra-deep ringwoodite diamond inclusions (DIs) [5]. Preliminary results demonstrate that based on partition coefficients for carbonatitic melts, an olivine in equilibrium with this melt should have ~50 ppm water, in direct contrast to the <1 to 25 ppm water measured in olivine DIs from Komsomolskaya and Sytykanskaya kimberlites. This inconsistency suggests that either the inclusions formed from a different liquid/fluid composition, or the inclusions were not in equilibrium with a carbonatitic diamond-forming liquid. In summary, hydrophilic-element contents of DIs are currently poorly constrained and demonstrate that olivine DIs from the SCLM may contain low-water contents compared to DIs in the deeper mantle. Such results have the potential for a significant break-through in understanding the origin of diamonds.

[1] Bell, D. & G.Rossman, (1992) *Science* **55**; [2] Snyder et al. (1995) *Amer. Mineral.* **80**; [3] Taylor et al. (2000) *Inter. Geol. Rev.* **42**; [4] Taylor et al. (2003) *Amer. Mineral* **88**; [5] Pearson et al. (2014) *Nature* **507**.