From what media were North Bohemian microdiamonds formed?

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Microdiamonds of North Bohemia are confined to discrete lithological layers within diamond-free rocks equlilibrated under HP granulite-facies conditions [1]. This suggests an internal carbon source for diamond formation. SEM, AFM, TEM and SIMS techniques allow characterization of diamond-forming media. Felsic UHP gneiss contains exclusively individual well-shaped diamond octahedra with smooth faces, enclosed in garnet, kyanite and zircon. In contrast, clusters of diamond cuboids with rough faces occur in garnet and zircon in the intermediate UHP garnet-clinopyroxene rock. Well-preserved diamond, and graphite in separate multiphase inclusions, are associated with quartz, rutile, apatite, and Ca-Mg carbonate in both rock types. A TEM study shows that octahedral diamonds are single crystals with regular interface towards the host phase, whereas cuboids are polycrystalline and their interface is irregular. Amorphous quenched fluid/melt occurs in rare cavities located close to, or at, the diamond interface, and in triangular cavities delimited by numerous newly-formed (111) crystal faces due to dissolution of diamond cuboids. In contrast, octahedral diamond dissolution is restricted to individual funnel-shape cavities located at the oucroping dislocation array (TEM), and similar-sized negative trigons (AFM) with symmetric and pointed-bottom depth profiles on (111) faces. Such trigons form during HP-HT experiments using fluid/melt with $H_2O:CO_2 \geq 50:50$ mol. %. Negative $\delta^{13}C$ values in both diamond types (-21 to - 33 ‰) correspond to organogenic carbon source. We conclude that both diamond types formed from high-density hydrous fluid/melt containing carbonatitic, silicic, saline, sulphate and phosphate components. The constrasting diamond morphology results from different degree of supersaturation, growth rate, and carbon species in the protolith.

[1] Kotková & al. (2011) *Geology* **39**, 667-670.