Inclusions in super-deep diamonds

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Super-deep diamonds may originate from a depth of between 300 and 800 km, although their precise depth of origin remains uncertain. When growing, they trap other minerals from their surroundings, which remain unaltered in their diamond capsule on their journey up to the surface of our planet. Through the study of these inclusions it is thus possible to reveal the secrets of deep unseen environments. In this study we aim to determine the formation pressure of super-deep diamonds for the first time by characterising two types of inclusions: $CaSiO_3$-walstromite and ferropericlase. To achieve this goal we investigated $CaSiO_3$-walstromite inclusions by a combination of in situ single-crystal X-ray diffraction, "single-inclusion elastic barometry" and in situ micro-Raman spectroscopy and we obtained an apparent entrapment pressure of ~7.1 GPa, corresponding to ~250 km, at a temperature of 1500 K. In addition, thermodynamic calculations suggested that single inclusions of $CaSiO_3$-walstromite cannot derive from $CaSiO_3$-perovskite. Preliminary X-ray micro-tomography and nuclear resonance scattering data were also collected on ferropericlase-bearing diamonds in order to detect micro-fractures around the inclusions and to determine whether the $Fe^{3+}/\Sigma Fe$ ratios are in agreement with lower mantle values or not.