Characterization of phosphorus-doped HPHT diamond crystals

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Abstract :

The incorporation of phosphorus (P) dopants as donor atoms in high pressure and high temperature (HPHT) diamond is investigated. P-doped samples under different HPHT growth conditions are analysed. Convincing confirmation of the phosphorus incorporation in the crystals during HPHT growth process is obtained. The P concentration on diamond (111) growth face ranges up to $2x10^{17}$ cm^{-3} (1 ppm) as measured by secondary ion mass spectroscopy (SIMS). Low temperature cathodoluminescence spectroscopy performed on samples demonstrates the incorporation of phosphorus in donor substitutional sites. A detailed characterization through cathodoluminescence will be presented and correlations between samples morphologies and dopants concentrations will be discussed.