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Defects in diamond created by NO⁺ ion implantation

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The formation of shallow n-type dopants in diamond is one of the major challenges for the electronic application of diamond. n-type behavior in diamond is observed for substitutional phosphorus and nitrogen, with activation energies of ~0.62 and 1.7 eV respectively. It has been theoretically found that the substitution of N-O molecule into the diamond lattice induces a shallow defects below the conduction band edge which may lead to n-type conductivity.

In this project we are exploring the possibility of achieving n-type conductivity in diamond by conducting an experimental investigation on the interaction between nitrogen and oxygen in the diamond as well as the related defects. This involves placing nitrogen and oxygen impurities close to each other into the diamond lattice by means of ion implantation; which has the advantage to provide greater accuracy of depth and location of ions in the host material.

Optical spectroscopy and electrical characterization techniques are used to investigate the nature and behavior of the defects induced by the implantation of N-O ions into type IIa CVD diamond samples.

In this presentation the experimental results of photoluminescence, Raman spectroscopy and cathodoluminescence will be discussed.

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