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(G*) (POS-12) MPCVD Diamond Films with varying Nitrogen Doping Times : Effect on NV Center Synthesis

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NV centers in a diamond crystal consist of a substitutional nitrogen atom next to a lattice vacancy. These commonly appear in two distinct charge states, the neutral NV center (NV^o) and the negatively charged NV center (NV^-). While the more commonly formed state is the NV^o , the NV^- center has S = 1 fine structure that has important magnetic field dependent fluorescence properties due to its trapped electron. Fluorescence of the NV^- center has many applications include bio-labelling, thermometry, magnetometry, and quantum information, among many others. Research to improve the uniformity and replicability of manufactured NV^- center-containing films is of great importance. Microwave plasma assisted chemical vapor deposition (MPCVD) of diamond with \emph{in situ} nitrogen doping has shown promise in the synthesis of these heteroepitaxially grown centers[1]. Currently the effect of different nitrogen doping times on the growth of NV^- centers is not well understood.
This poster will present the results of an investigation of varying N_2 doping times during diamond synthesis and how this affects the growth of both NV^o and NV^- centers within polycrystalline MPCVD diamond films. Investigation with Raman spectroscopy, photo luminescence spectroscopy and X-ray diffraction were carried out. By increasing or decreasing the N_2 doping time and studying the variation of the intensity of the 637 nm NV^- photoluminescence (PL) spectral line, we derive a relationship between doping time and density of NV^- centers.

[1] Ejalonibu, H. A., Sarty, G. E., Bradley, M. P. (2019, April 25). "Optimal parameter(s) for the synthesis of nitrogen-vacancy (NV) centres in polycrystalline diamonds at low pressure" - \emph{Journal of Materials Science: Materials in Electronics.} SpringerLink. https://link.springer.com/article/10.1007/s10854-019-01376-z

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nitrogen vacancy centers

Keyword-2

microwave plasma

Keyword-3

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