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Raman scattering of Nitrogen incorporated diamond thin films grown by hot filament chemical vapor deposition

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Abstract

A detailed Raman scattering analysis of nitrogen incorporated polycrystalline diamond thin films grown using $\text{NH}_3/\text{CH}_4/\text{H}_2$ gas mixture in hot filament chemical vapor deposition system is presented. To understand the nitrogen bonding configuration in these films, diamond films are grown by replacing H_2 with D_2 in the gas mixture. The Raman peak observed at $\sim 1190 \text{ cm}^{-1}$ showed an isotopic shift to $\sim 830 \text{ cm}^{-1}$ upon replacing H_2 with D_2 in the gas mixture. With the present Raman analysis, the peak at $\sim 1190 \text{ cm}^{-1}$ is assigned to $\text{C}=\text{N}-\text{H}$. Secondary ion mass spectroscopy revealed the abundance of nitrogen in the sub-surface region of the annealed diamond thin films.

Keywords: N-doped diamond thin film; Raman spectroscopy; Chemical vapor deposition

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