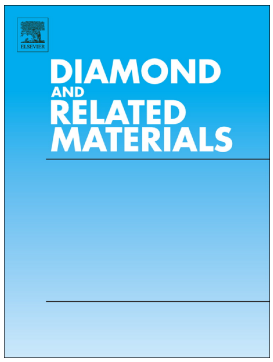

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Growth and characterization of polycrystalline diamond films on silicon using sugarcane bagasse as carbon precursor at atmospheric pressure by thermal chemical vapor deposition

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Abstract

Here we demonstrate that by using sugarcane bagasse as a carbon precursor, highly crystalline diamond films possessing H3 [N-V-N] and [Si-V]$^-$ optical centers can be grown on Si (100) substrates using a simple thermal chemical vapor deposition (thermal-CVD) system at atmospheric pressure and reduced temperature (~900 °C). In this process, the rich chemistry of effluent gas species produced during the pyrolysis of sugarcane bagasse is found to play a vital role. Diamond films have also been characterized by using X-ray Diffraction (XRD), scanning electron microscope (SEM), micro-Raman, and photoluminescence (PL) spectrometer. Presence of nitrogen and silicon related defect was probed by PL and H3, i.e. [N-V-N] at 505 nm and [Si-V]$^-$ at 736 nm optical centers have been confirmed. The other observed peak at 445.7 nm, 468 nm, and 884 nm assigned to nitrogen-containing defects.

Keywords: Diamond growth, Thermal-CVD, H3 and [Si-V]$^-$ center

1. Introduction

Due to the outstanding combination of mechanical properties such as very high hardness including a low coefficient of friction and high wear resistance as well as electronic [1-3], optical [4]

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