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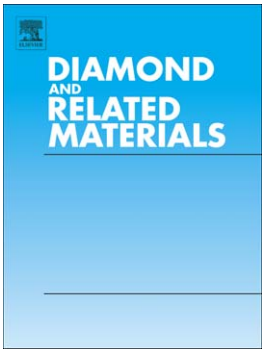

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A facile method for the deposition of thermally stable diamond like carbon thin films *via* carbon dioxide precursor gas

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Abstract

The thermal stability and tribological performance of silicon- and oxygen-incorporated diamond-like carbon (DLC) and silicon doped-DLC films were investigated. The DLC and DLC:Si are deposited on various (silicon, stainless steel and aluminium) substrates within the thickness range 200-400 nm by radio frequency plasma-enhanced chemical vapour deposition (PECVD) method. Carbon dioxide (CO_2) precursor gas is used to reduce the hydrogen content and to increase the adhesion of the films to the substrate. The X-ray photoelectron spectroscopy, Raman spectroscopy, surface profilometry and nano-indentation are used to study the chemical composition, microstructure, thermal stability and mechanical properties of the films. For CO_2 precursor made DLC samples, Raman parameters did not show any significant change up to temperature 500^{o}C. The lowest coefficient of friction was found to be 0.298 for the DLC:Si film prepared with CO_2 at room temperature and corresponded lowest wear rate of 1.77 x 10^{-10} mm^3/Nm. The micro-structural properties at various annealing temperature were critically analysed by monitoring graphitization behaviour and oxidation of the film surface.

Key words: DLC, Thermal stability, Hardness

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