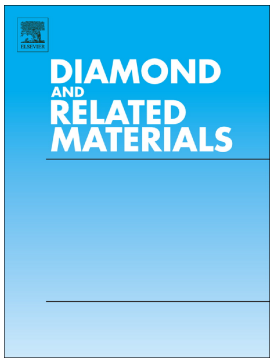

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Effect of unbonded hydrogen on amorphous carbon film deposited by PECVD with annealing treatment

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Abstract

A type of hydrogenated amorphous carbon film was deposited by plasma-enhanced chemical vapor deposition. With high-energy ion bombardment and high ionization rate, hydrogen was found to exist in the film mainly in forms of hydrogen molecules, as well as isolated atoms, instead of bonding with carbon atoms. To investigate the effect of unbonded hydrogen on thermal stability of amorphous carbon film, specimens were annealed and the temperatures of annealing were selected on the basis of differential scanning calorimetry (DSC) test. The chemical composition and structural properties of the contained samples were analyzed by scanning electron microscopy/ energy dispersive spectrometer (SEM/EDS), 3D non-contact surface mapping profiler, Fourier transformation infrared spectroscopy (FTIR), mass spectrometry (MS), Raman spectroscopy, X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS). The mechanical and tribological properties were investigated by nano-indentation, stress-tester and ball-on-disk tribometer. The results showed that