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Growth of nitrogen-containing diamond-like carbon using a magnetized sheet plasma source

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Nitrogen-containing diamond-like carbon (DLC:N) film is grown on titanium coated stainless steel substrates in a $C_2H_2:N_2:Ar$ environment using a magnetized sheet plasma source. The substrates were carbonitrided for 30 min with a discharge current of 4 A, a $C_2H_2:N_2:Ar$ gas ratio of 1:1:5, and a gas filling pressure of 1.5×10^{-2} Torr. The film coating was characterized by scanning electron microscopy (SEM), energy dispersive x-ray (EDX), and Raman spectroscopy. SEM surface images show clumped cauliflower shaped microstructures, while cross section images show binary layers of the Ti and DLC:N films. The EDX spectrum of the surface indicates that the film has high carbon and low nitrogen contents. An eight-point Gaussian fitting using Matlab 7 was used to perform analysis on the Raman spectra. It is observed that the D and G peaks are located at 1415 and 1590 cm^{-1} , respectively, with $I_D/I_G = 0.88$. The growth process does not require any application of additional substrate heating which is common in most DLC growth methods.

Keywords

magnetized plasma

DLC

carbonitriding