Raman analysis of DLC and Si-DLC films deposited on nitrile rubber

M. Lubwama, B. Corcoran, K.V. Rajani, C.S.Wong, J.B. Kirabira, A. Sebbit, K.A. McDonnell, D. Dowling, K. Sayers,

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Abstract

In this study a hybrid diamond-like carbon (DLC) and silicon doped diamond-like carbon (Si-DLC), with and without Si-C interlayers, were deposited onto nitrile rubber substrates. The deposition was done in a closed field unbalanced magnetron sputtering ion plating (CFUBMSIP) rig in Ar/C4H10 plasma. A combination of visible (488 nm) and ultra-violet (UV; 325 nm) Raman analysis was used to determine the G-peak dispersion of the films. Raman analysis was also used to estimate the hydrogen concentration and residual stress in the films. Calculated hydrogen values for all of the films were between 26 and 31%. The residual stress estimates of the films indicated that the inclusion of Si dopant and Si-C interlayers reduced compressive stress in these films. Raman analysis of the wear tracks indicated an increase in the G-peak position which could indicate that graphitization occurred during pin-on-disc experiments.

Keywords: DLC; Si-DLC; G peak dispersion; Nitrile rubber; Raman spectroscopy; Tauc gap