

# **Role of Si-C Interlayer on the Properties of DLC and Si-DLC Films Deposited on Nitrile Rubber**

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## **Abstract**

Diamond-like Carbon (DLC) and Silicon doped diamond-like carbon (Si-DLC) films were deposited on nitrile rubber substrates by closed field unbalanced magnetron sputtering ion plating system. Comparison was made for DLC and Si-DLC films deposited with and without Si-C interlayers. The film properties were determined by scanning electron microscopy (SEM), Raman spectroscopy, hydrophobicity studies, micro-hardness tests and adhesion investigations. Tribological performance under dry and wet sliding was also investigated. The fracture cross-section of the films showed a very dense, non-columnar microstructure at bias voltage of -30 V. Values of the ratio of the intensities of the D and G peaks ( $I_D/I_G$ ) generally tended to increase in both the DLC and Si-DLC film compared to when the Si-C interlayer was included in the films. The increase in the  $sp^2$  content was a result of the Si-C interlayer which also determined the hydrophobicity of these films. The hybridization of carbon in terms of  $sp^2$  and  $sp^3$  bonding was used to interpret these results. The tribological investigation showed dependence on the tribological condition under investigation and the atomic percentage of Si in the film.

**Keywords:** *Adhesion; Magnetron sputtering; Micro-hardness; Raman spectroscopy; Si-C interlayer; Tribology*