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# Integrated characterization study of Diamond like Carbon (DLC) synthesized by 2.45GHZ microwave electron cyclotron resonance (ECR) plasma CVD

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## Abstract

DLC are being used extensively for the protection and life extension of engineering components exposed to adverse environmental conditions of wear and/or corrosion during service in automobile engine, magnetic storage, IR optic devices. In many instances in industrial applications like automotive engine, magnetic storage DLC coating is considered as a part of the structure and is deposited on the components in batch process. In the industrial framework a much lean methodology for process and quality control is adopted. Integrated characterization study was carried on DLC deposited by electron cyclotron resonance (ECR) plasma on p-type Si (111) substrate using methane as precursor and argon as carrier gas to understand suitability of each technique in providing information about quality of DLC. The deposition bias voltage was varied from -60 V to -150 V using 13.56 MHz RF power applied to the substrate. The results obtained from Raman Spectroscopy, X-ray photoelectron spectroscopy (XPS), Spectroscopic Ellipsometry, Contact and X-ray reflectivity (XRR) are correlated. The results have been attempted to explain by newer advancement in the theory like quantum electronic activation of some  $sp^3$  atomic rearrangement, subplantation and knock-on penetration mechanism of atomistic growth mechanism.

**Keywords:** Diamond like carbon, Electron Cyclotron Resonance, Raman Effect, spectroscopic ellipsometry, X-ray Reflectivity, contact angle, surface roughness, X-ray photoelectron spectroscopy, subplantation, quantum electronic activation.

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