Enhanced field emission properties of PECVD synthesized chlorine doped diamond like carbon thin films

D. Banerjee, K.K. Chattopadhyay

PII: S0257-8972(14)00384-3
DOI: doi: 10.1016/j.surfcoat.2014.04.054
Reference: SCT 19374

To appear in: *Surface & Coatings Technology*

Received date: 6 December 2013
Revised date: 19 April 2014
Accepted date: 21 April 2014

Please cite this article as: D. Banerjee, K.K. Chattopadhyay, Enhanced field emission properties of PECVD synthesized chlorine doped diamond like carbon thin films, *Surface & Coatings Technology* (2014), doi: 10.1016/j.surfcoat.2014.04.054

Enhanced field emission properties of PECVD synthesized chlorine doped diamond like carbon thin films

D. Banerjee[a)] and K.K. Chattopadhyay[a,b)*]

[a)]Thin Film & Nanoscience Laboratory, Department of Physics,
[b)]School of materials Science and Nanotechnology
Jadavpur University, Kolkata 700 032, India

Abstract:

Chlorine doped diamond like carbon (DLC) has been deposited for the first time on both Si and glass substrate by plasma enhanced chemical vapor deposition using acetylene and carbon tetrachloride as the source for carbon and chlorine respectively. The Chlorine concentration is varied from 0 % to 3.63 % as confirmed by X-Ray Photoelectron Spectroscopy. The pure and doped samples were characterized by Atomic Force Microscopy, UV-Vis-NIR spectroscopy and FTIR spectroscopy. The electron field emission properties of all the pure and doped samples have been studied in high vacuum field emission set up and it is seen that the field emission properties of the DLC sample has been considerably improved after chlorine being added to it. The doped sample shows good field emission stability with turn on field as low as 4.75 V/μm for highest Chlorine concentration. The dependence of field electron emission on inter-electrode distances was studied for three different inter-electrode distances. The enhanced field emission characteristics have been explained in terms of dielectric inhomogeneity induced field enhancement in $sp^2 – sp^3$ bonded mixed carbon network.

Keywords: Diamond like carbon, Optical property, Field emission, Work function,

PACS: 81.05.U-; 79.70.+q; 73.30.+y ; 79.60.-i

---

[*]**Corresponding author:** kalyan_chattopadhyay@yahoo.com. Tel: 91 33 2413 8917