P/A/I/Nano seminar

FW300, Feb. 24th 2009 16:00

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Photocurrent Action Study of Diamond Like Carbon Films on Si Substrates

Diamond-like carbon (DLC) films are tetrahedral amorphous carbons (aD) that contain a chaotic carbon mixture with sp^3 and sp^2 hybrid sites.[1] Recently, DLC films were found to be a unique material for electrical applications. Characteristics of DLC film, such as negative electron affinity (NEA) of DLC surface, show an excellent electron emitter for field emission array (FEA) application.[2] The thermionic emission effect can be observed upon heating nano-tip DLC films, which was thermally activated as the emission current increased exponentially with the increase of temperature.[3] Enhancement of electrical conductivity of DLC due to impurities doping was reported early, where The donor atoms such as nitrogen could sizable increase emission current sizably and electron emission shows highly reproducible.[4]

Use of the DLC films in antireflection and protective coatings for silicon solar cell were reported recently.[5] It has been shown that the advantages of DLC coatings are not only increasing the surface hardness but also decreasing the reflection losses, and passivating the active center recombination.[6] More importantly, the use of DLC films for photovoltaic heterojunction structure solar cells were reported.[7] Impurities doped DLC film such as boron doped DLC and nitrogen doped DLC were shown to be very promising p-type layer and n-type layer, respectively, deposited on silicon solar cells. The observations indicated that DLC films were a significant factor in the increase of solar cell efficiency.[8] In this talk, a newly constructed system for processing DLC film and device will also be presented.

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[4] M. C. Kan et al., “Enhanced field emission from nitrogen-doped amorphous diamond,” *J. Mater. Res.*, **18**(7), 1594-1599 (2003)

[5] M. Alaluf et al., “Amorphous diamond-like carbon films-a hard anti-reflecting coating for silicon solar cells,” *Thin Solid Films,* **256** 1-3. (1995)

[6] N. I. Klyui et al., “Silicon solar cells with antireflection diamond-like carbon and silicon carbide films,” *Solar energy materials and solar cells*, **72**, 597-603 (2002)

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