Paper III: PHS13 CARBON NANOMATERIALS AND THEIR APPLICATIONS

Unit-I: Fundamentals of Carbon Nanomaterials

Bonding of Carbon Atoms –hybridization - allotropes of carbon - structure and properties of carbon nanotubes (CNT), fullerene, graphene and graphene oxide.

Unit –II: Synthesis Methods

Vacuum Techniques-arc discharge - laser ablation - chemical vapour deposition - plasma enhanced CVD- wet methods- hummer's and modified hummer's method.

Unit-III: Material Processing

Purification of CNT, graphene, graphene oxides- dispersion - exfoliation - functionlisation of CNT - fabrication of thin films –solution processing -spin coating - spray pyrolysis.

Unit-IV Characterization Techniques

Ultraviolet visible-NIR spectroscopy - FTIR - Powder XRD – micro Raman - Scanning Electron Microscopy – Tunneling Electron Microscopy - Atomic Force Microscopy – TGA- electrical and dielectric properties – four probe method.

Unit-V Applications

Gas sensors – Energy Storage – Solar energy harvesting - Field Emission Display – X-ray production -Transparent conducting thin films for display.

References:

1. M. Meyyappan, Carbon Nanotubes Science & Applications CRC Press, USA (2005).
2. Yury Gogotsi, Carbon Nanomaterials, CRC Taylor & Francis Group, Boca Raton (2006).
3. Michel J.O'Connell, Carbon Nanotubes Properties and Applications, CRC Taylor & Francis Group, Boca Raton (2006).
4. R.Saito, G. Dresselhaus & M S Dresselhaus, Physical Properties of Carbon Nanotubes, Imperial College Press, London (2003).
5. Rainer Waser, Nanoelectronics and Information Technology Advanced Electronics Materials and Novel Devices, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany (2003).

Mrs. RB/BM for Senate approval