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Profile:

Name:	Dr. Sunil P. Bhardwaj	Date of Birth:	14th August 1980.
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Research Interest:

- ✓ Synthesis and applications of carbon nanotubes.
- ✓ Growth mechanism of Carbon nanotubes and Graphene.
- ✓ Transport properties of carbon nanotubes and metal hybrids.
- ✓ Electronic structure and electronic transport properties of graphene and carbon nanotubes.

Awards:

- ✓ **Training and Research in Italian Laboratories (TRIL) fellowship** from International Center for Theoretical Physics Trieste, Italy (2012).
- ✓ Post-doc Fellowship within the **FP7 European project “Technotubes”**, National Laboratory TASC, Trieste, Italy. 2010.
- ✓ **MIUR (INDO – ITALIAN Fellowship)** for Postdoctoral research at Dipartimento Ingegneria Elettrica (DIE), University of Genova, GENOVA, ITALY. 2009
- ✓ **Senior Research Fellow (SRF)** Board of Research in Nuclear Sciences (BRNS), Bhabha Atomic Research Centre BARC, MUMBAI, INDIA. 2007
- ✓ **Junior Research Fellow (JRF)** Board of Research in Nuclear Sciences (BRNS), Bhabha Atomic Research Centre BARC, MUMBAI, INDIA. 2005

Qualification:

Ph. D. (2010): Birla College of Arts, Commerce and Science, University of Mumbai, India.

Supervisor: Prof. Maheshwar Sharon

Dissertation: **Synthesis and Applications of Carbon nanomaterials from Plant Based Precursors.**

Most of the carbon nanomaterials have been synthesized from precursors based on the fossil fuels like petroleum products, acetylene, etc. In my Ph. D. work I have used different plant based precursors to obtain Carbon nanomaterials by CVD. The work included the use of various oil seeds (e.g., soybeans, mustered, etc.), and plant based fibers (like sugar cane

Bagasse, coconut fibers, etc.) and few synthetic materials to synthesize carbon nanomaterials. So formed carbon nanomaterials are purified and analyzed with SEM, XRD and RAMAN. Further they are used for Hydrogen Storage application and also as anode in Li-ion battery. It was found that Carbon nanomaterials obtained from Bagasse are showing highest hydrogen adsorption capacity. SEM micrograph of the carbon obtained from Bagasse is highly porous in nature with axial channels throughout the fiber length. The process of CVD was optimized to get better results. Further when incorporated with nano metals adsorption capacity was boosted. These prepared carbon nanomaterials are also studied for its Li - intercalation properties in carbon matrix. It was found that the carbon nanomaterials obtained from Bamboo (*Bambusa bambus*) and Soap-nut seed (*Sapindus mukorossi*) are giving good Li-ion intercalation property.

M. Sc. (2003): Organic Chemistry from Birla College of Arts, Commerce and Science, University of Mumbai, India With 60.30% of marks.

B. Sc. (2001): Chemistry from Birla College of Arts, Commerce and Science, University of Mumbai, India With 73.50% of marks.

Work Experience:

Postdoc: Istituto Offidna dei Materiali - CNR, National Laboratory TASC, Area Science Park - Basovizza, Edificio MM, Strada Statale 14, Km.163.5 I-34149 Trieste, ITALY.

Duration: From 01/04/2010 to 31/03/2013 (3 Years)

Summary: The research I conducted at IOM has been focused on the growth and characterization of carbon nanotubes (CNTs) via in situ X – ray photoemission spectroscopy by CVD. I studied test systems with the objective to find the best protocols for the controlled synthesis of CNTs on conductive substrates, compatible with industrial CVD processes. I focused my work on some of the promising systems with Fe as a catalyst, Ta and TiN films as substrates and C₂H₂ as feedstock gas. The mainly studied systems were:

1. Growth of CNTs on transparent ITO substrates.
2. Growth of CNTs on TiN, Ta, SiC, ZnO and Al₂O₃ substrates.
3. Effect of plasma and thermal treatments on catalyst – substrate interaction.
4. In-situ XPS of graphene growth on single crystal Ni
5. Use of Ferritin as catalyst for CNT growth.

R & D Associate: Dipartimento Ingegneria Elettrica (DIE), University of Genova, Genova, ITALY

Duration: From 05/11/2003 to 31/03/2004 (5 Months)

Summary: Carbon nanotubes were aligned perpendicular and parallel to the polymer film by application of external magnetic field in polyvinyl butaryl (PVB). FTIR of these films suggested that there is no chemical reaction between CNT and polyvinyl butaryl, but the decrease in G band intensity of carbon nanotube in Raman spectra suggested that the tangential site of carbon nanotubes are facing the surface of polymer film indicating the alignment of the carbon nanotubes in CNT/polymer composite.

R & D Associate: Model College

Duration: From 05/11/2003 to 31/03/2004 (5 Months)

R & D Associate: KV pendherker

Duration: From 05/11/2003 to 31/03/2004 (5 Months)

R & D Associate: Model College

Duration: From 05/11/2003 to 31/03/2004 (5 Months)

R & D Associate: Amoli Organics

Duration: From 05/11/2003 to 31/03/2004 (5 Months)

R & D Associate: Tytan Organics

Duration: From 05/11/2003 to 31/03/2004 (5 Months)

References:

- ✓ **Prof. Maheshwar Sharon**
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