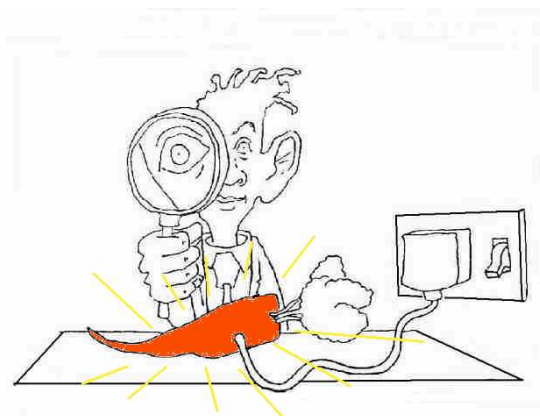


Nanocomposites for Photovoltaics 346.222

Nanostructured Organic Materials: Fabrication, properties & applications



Course Description

Nanoscience and Nanotechnology makes use of materials and systems at a length scale of few nanometers to few hundred nanometers. As a scientific discipline, it considers unique properties of materials produced by intentionally created nanometer scale distribution of atoms or molecules. This also includes protocols of formation of such nanostructures and methods of their structure, as well as physical properties characterization.

Present and future applications of nanostructured organic materials spread from molecular and printed electronics devices to organic solar cells, chemical and bio-sensors and many others. This course is aimed to introduce the important concepts and applications of nanoscience and nanotechnology to multidisciplinary audience and should be suitable for graduate students, as well as for advanced undergraduates.

Introduction: Overview of Nanoscience

- Theory, definitions and history – properties at nanoscale. Different classes of nanomaterials.

Nanofabrication Tools

- “Top-down” approach: Nanolithography, CVD, MEMS.
- “Wet deposition” techniques (Langmuir-Blodgett technique, spin-coating, dip-coating).
- “Bottom up” approach: Sol-gel processing, colloidal particles.
- Self-assembly and self-organization in molecular systems.

Characterization of Nanomaterials

- Diffraction techniques, spectroscopy and modeling.
- Imaging techniques: Scanning and transmission electron microscopy.
- Scanning probe microscopy techniques.

Specific Classes and Applications of Nanomaterials

- Carbon based nanomaterials: Fullerenes, nanotubes and graphene.
- From Molecular Electronics to Nanoelectronics and Printed Electronics.
- Nanostructured materials in solar energy conversion.
- Nanosensors and nanoactuators. Bio-inspired “smart” nanomaterials.

See you in my class!

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