



CHEM 542

SELECTED TOPICS IN ORGANIC CHEMISTRY NANOCOMPOSITES

FOR MASTER STUDENTS IN CHEMISTRY PROGRAM

PRE-REQUISITES COURSE

NA

CREDIT HOURS 2 (2+0+0)

COURSE OBJECTIVES

Upon successful completion of this course, the student should be able to:

- Distinguish different synthesis properties, identify between characterization methods and relate applications of nanocomposites.
- Demonstrate an understanding novel synthesis method of nanocomposites and nanofabrication ranging from 'top-down' lithography approaches to 'bottom-up' self-assembly and nanopatterning.
- Recognize various nanocomposites characterization techniques, including X-ray diffraction, crystal structure analysis, electron microscopy, and atomic force microscopy.
- discriminate the unique physical and chemical properties of nanocomposites (mechanical, electronic, optical, magnetic and thermal properties).
- Differentiate between the applications of nanostructures, such as catalysts for biomass conversion and solar cell.



Topic **COURSE** Descriptions

- General introduction and history of nanotechnology.
- Importance of nanoparticles in industries and in our lives.
- Approach in nanotechnology and typical synthesis of nanoparticles. Properties of nanomaterials, chemical and physical properties. Reasons for changing properties.
- Calcification of nanostructured and the chemical and physical properties of different nanostructured. Carbon based Nanomaterials (Fullerenes, carbon-nanotubes and graphene). Nanomaterials based catalysts (inorganic nanomaterials, metal oxide supports, supported nano-material catalysts)
- Methods of preparation of nano-formulations and mesoporous materials
- Nanoparticle synthesis and fixtures nanoparticles Basic synthesis and fabrication methods for nanomaterials (CVD, impregnation, sol-gel, microemulsion, template, hydrothermal) titanium nanotubes with and without palladium, silver and gold nanoparticles, and some other fixtures.
- Spectroscopic and microscopic tools used in nanomaterials characterizations.
- General industrial application for nanoscale systems and fixtures, nano-optic applications, bio-nanotechnology applications and medical nanotechnology applications.
- Nanotechnology and clean technology: What are clean technology challenge facing in the areas of energy, water and environment, exploring the contribution of nanotechnology to solve these problems, the current obstacles faced by nanotechnology.



References

- Nanoscale Science and Technology, John Wiley & Sons, (2005).
- Nanochemistry. G.B. Sergeev, K.J. Klabunde, Elsevier, 2013, ISBN: 978-0-444-59397-9
- Introduction to Nanoscience and Nanotechnology, Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, John J. Moore, CRC Press. Copyright, 2009.
- Nanomaterials and Nanochemistry, C. Bréchnignac, P. Houdy, M. Lahmani, Springer Science & Business Media. Copyright, 2006.
- “Nanochemistry, A Chemical Approach to Nanomaterials”, G. Ozin and A. Arsenault, RSC (Royal Society of Chemistry), 2005.
- “Nanostructures and Nanomaterials”, G. Cao, Imperial College Press, 2004

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