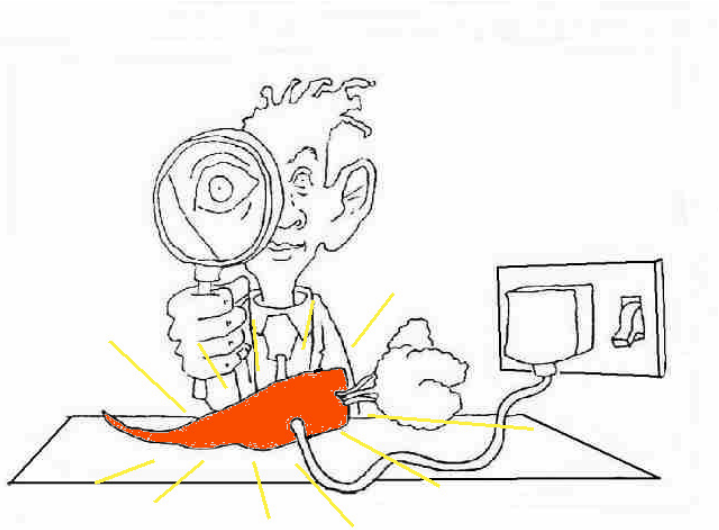
SYLLABUS PAPR 695

Nanostructured Organic Materials



COURSE DESCRIPTION

Nanoscience is an interdisciplinary field of knowledge which considers unique properties of materials produced by intentionally created nanometer scale distribution of density of atoms or molecules in space (arrays), the protocols of formation of such nanostructures, and novel applications of such advanced materials in micro- and opto-electronics, computers, sensors, biomaterials and other related fields of materials science.

In this course we will consider nano-structured organic and polymer materials which belong to so-called "soft condensed matter". We will study structure-properties relationships, mechanical, thermal, electrical, optical and electro-optical properties of such advanced materials, modern deposition techniques and methods of their structure and properties characterization at the nano-scale. Present and future applications of nanostructured organic materials include molecular and printed electronics devices, flexible panel displays, solar cells and electro-optical devices, chemical and bio-sensors and will be also considered in this class.

COURSE TYPE: **3 credit hours lecture**

INSTRUCTOR: **Dr. Valery Bliznyuk, office G 247 CE&AS ph.: (269) 276-3213**
Email: valery.bliznyuk@wmich.edu

CLASS TIME and PLACE: **TBA** CE&AS Building **6:30 - 9:15 pm**
(day of the week will be chosen later)

TOPICS TO BE CONSIDERED

1. Monolayers of organic molecules and molecular assemblies. Molecular electronics and photonics
2. Methods of formation of organized mono- and multilayers of organic molecules (Langmuir-Blodgett deposition, spin-coating, dip-coating, self-assembly, layer-by-layer deposition)
3. Vacuum deposition techniques. Photolithography. MEMS.
4. Organic semiconductors and synthetic metals.
5. Experimental techniques for nanostructure and nanoproperties characterization (X-ray diffraction, electron microscopy, Scanning probe microscopy techniques)
6. Molecular design and modeling.
7. Colloidal systems. Nanoparticles and nanotubes and their applications.
8. Polymer-based nanocomposites: properties and applications.
9. Polymers with a special architecture. Liquid crystalline systems. Linear and nonlinear optical and electrooptical properties. Applications in displays and other devices. Advanced organic materials for data storage.
10. Polymer materials for fuel cells, solar cells and electro-optics applications.
11. Ultra-porous organic and hybrid materials. Sol-gel synthesis. Thermal conductors and insulators.
12. Biocompatible materials. Chemical and biosensors.
13. Your projects

TEXTBOOK: **A.Nabok**, *Organic and Inorganic Nanostructures*, Artech House 2005

RECOMMENDED LITERATURE:

C.Dupas, P.Houdy, M.Lahmani, *Nanoscience: Nanotechnologies and Nanophysics*, Springer-Verlag Berlin Heidelberg 2007

Hari Singh Nalwa, *Nanostructured Materials and Nanotechnology*, Academic Press, 2002

Advanced Materials – international journal 1997-2008

PREREQUISITE: PHYS 330, CHEM 430 (desirable, please discuss with me)

ASSIGNMENTS: Short 15 minute test (quiz) and
Homework assignments (Weekly)
Individual projects
Comprehensive final exam

GRADING:				
Homework	30%	Quizzes	20%
Individual Projects	30%	Final Examination	20%

ASSIGNMENT OF COURSE GRADES:

91%	A	76%	CB
86%	BA	71%	C
81%	B	66%	DC