

NOTE: This course requires an on-site lab. Students must be able to travel to Charlottesville and Blacksburg during Week 11.

NANOCARBON MATERIALS
VT Course #ECE 5984, UVa Course #ECE 695
Spring 2008
Tuesday and Thursday 2-3:15 p.m.

Instructors:

Dr. Harry C. Dorn:

Professor of Chemistry &
Director, Center for Self-Assembled Nanostructures and Devices
(CSAND) and the Carbonaceous Nanomaterials Center (CNC)
Virginia Tech
Office: 1109 Hahn Hall; Blacksburg, VA 24061
E-mail: hdorn@vt.edu
Phone: 540-231-5953
Fax: 540-231-3255

Web Page: <http://www.dorn.chem.vt.edu/teaching.html>
<http://learn.vt.edu> (Blackboard)

Dr. Mool C. Gupta

Langley Distinguished Professor &
Director for NSF I/UCRC Laser Center
Dept. of Electrical & Computer Engineering
University of Virginia – P.O. Box 400743
Thornton Hall, 351 McCormick Rd.
Charlottesville, Virginia 22904-4743
E-mail: mgupta@virginia.edu
Phone: 434-924-6167
Fax: 434-924-8818

Web Page: <http://www.faculty.virginia.edu/laser>

Course Description:

The goal of this course is to introduce students to the "state-of-the-art" in the area on advanced carbon nanomaterials including: (fullerenes, metallofullerenes, nanotubes, graphene) and their potential applications in nanotechnology.. Students are expected to gain knowledge of structure, properties, fabrication, and applications of carbonaceous nanomaterials. Structure control at the nanoscale and effect of structure on properties will be discussed.

Background References:

1. Di Ventra, Massimiliano; Evoy, Stephane; Heflin, James R., Jr. (Editors) Introduction to Nanoscale Science and Technology Publisher: Kluwer Academic Publishers, (2004).
2. Y. Gogotsi (Editor), *Carbon Nanomaterials* (CRC Press, Boca Raton) 2006.
3. Hugh O. Pierson, "Handbook of Carbon, Graphite, Diamond and Fullerenes," Noyes Publications, Park Ridge, NJ, 1994
4. P.J.F. Harris, "Carbon Nanotubes and Related Structures," Cambridge University Press, Cambridge, 1999.
5. O.A. Shenderova, V.V. Zhirnov, and D.W. Brenner, Carbon Nanostructures, *Critical Reviews in Solid State and Materials Sciences*, v. 27(3/4) 227–356 (2002)

Grading Scheme:

Midterm Test	30%
Final	30%
(Homework)	10%
Term paper	20%
Laboratory	10%

Tentative Class Schedule:

Week 1	Course Organization The Element Carbon – Crystal Structure, Chemistry, Phase Diagrams
Week2	Graphite: Structure, Synthesis, Properties and Applications Graphene
Week3	Non Planar Graphitic Structures: Carbon Onions, GPC Cones, metallofullerenes fabrication, characterization and unique properties
Week 4	Advanced Carbon Materials: Glassy Carbon, Activated Carbon, CDC
Week 5	Midterm
Week 6	Fullerenes
Week 7	Nanotubes 1: Structure, forms, functionalization
Week 8	Nanotubes 2: Properties like electronic, optical, mechanical, magnetic and thermal
Week 9	Fabrication and characterization of CNT
Week10	CNT Applications materials for energy applications, Nanoscale devices and nanoelectronics
Week 11	Laboratory
Week 12	CNT Applications: electron emitters and x-ray sources, sensors, nanocomposites, biomedical and AFM tips etc.
Week 13	Final Term papers