

Spring 2021, **Chem 573 Syllabus, Nanochemistry, 2 credits**

(this/other key maters. on Cybox: iastate.box.com)

Meets: **Mon & Wed 11-11:50 am, 2205 Gilman.**

Office hrs. Mon & Wed 12:00-1 pm, or by appointment.

Dr. Javier Vela, University Professor

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Suggested textbooks: (none required)

- Owens & Poole (O&P), *The Physics and Chemistry of Solids*, Wiley, 2008
- Hornyak, Dutta *et al.*, *Introduction to Nanoscience*, CRC, 2008
- Kuno, *Introductory Nanoscience*, Garland Science, 2012
- Cao & Wang, *Nanostructures and Nanomaterials*, 2nd Ed., World Scientific, 2011
- Lindsey, *Introduction to Nanoscience*, Oxford, 2010

"(2-0) Cr. 2. Alt. S., offered odd-numbered years. Prereq: CHEM 301, CHEM 324

Synthesis, characterization, properties and applications of nanoscale materials (\approx 0.5-500 nm), relationship with molecular, meso and bulk compounds. Chemistry of solid surfaces, zero-, one- and two-dimensional nanostructures (0D, 1D, 2D), semiconductor quantum dots, plasmonic nanoparticles, carbon nanomaterials, porous nanomaterials, potential health and safety impacts."

Class structure: Lecture plus in-class discussion and presentations. You are expected to read appropriate textbook content and any assigned papers in advance of class. Must attend the seminars below.

<u>Week(s)/Date(s)*</u>	<u>Subject*</u> (* = <u>tentative</u>)	
Mon Jan 25, Wed Jan 27	Course Intro & Syllabus, Nanosolids: Structures (O&P Ch 1)	
Mon Feb 1, Wed Feb 3	Polytypism, lattice mismatch	
Mon Feb 15, Wed Feb 17	Epitaxy, gdots & blinking, cation exchange	
Mon Feb 22, Wed Feb 24	Nanosolids: Surfaces (O&P Ch 1)	
Mon Mar 1, Wed Mar 3	Owen/Green nomenclature	
Mon Mar 8 Wed Mar 10	Characterization (O&P Ch 2), Bragg, Scherrer, PLE	
Mon Mar 15, Wed Mar 17*	Nano vs. bulk (O&P Ch 3) / *First midterm	
Mon Mar 22, Wed Mar 24	Synthesis and reactivity (O&P Ch 4)	
Mon Mar 29, Wed Mar 31	Nucleation theory, La Mer, ripening, molecular tuning, single source precursors, ligand removal	
Mon Apr 5, Wed Apr 7	Molecular tuning, single source precursors, ligand removal	
Mon Apr 12, Wed Apr 14	Morphology, Nanocarbons	
Mon Apr 19, Wed Apr 21	Nano bonding (O&P Ch 6)	
Mon Apr 26, Wed Apr 28	Transport (O&P Ch 8), photovoltaics	

	Nanostructuring (O&P Ch 11), porosity/porous materials, sol-gel, surface area/BET	
May 3-7	Final exams - <u>date/time tbd</u>	

Grading composition (out of 100):

Exams (80): One midterm (40), one final (40) (dates tbd). All exams are open book(s)/open resource(s).

Problem sets: 20 (2 random end-of-chapter from O&P upon completion of each chapter).

Optional project, worth up to a maximum of 10 extra points, for either:

- Development of a nanochemistry lab demonstration based on a 573-related topic, or creation of a Wikipedia article on a 573-related topic (to be pre-approved by me, must explain a concept or idea to the general public/lay audience).

Grading scale: **A=100-95%, A⁻=94-90%, B⁺=89-86%, B=85-83%, B⁻=82-80%, C⁺=79-76%, C=75-73%, C⁻=72-70%, D⁺=69-66%, D=65-63%, D⁻=62-60%, F=59-0%**

Any form of **academic misconduct** is a violation of ISU Student Disciplinary Regulations. This includes, but is not limited to copying or sharing answers on tests or assignments, and plagiarism. Depending on the act, a student could receive an F grade on the test/assignment or course, and could be suspended or expelled from the University. See Academic Regulations at <http://www.dso.iastate.edu/ja/academic/misconduct.html> for more details. All cases that come to our attention must be reported to the Dean of Student Office.

Disability Accommodations: Please address any special needs or special accommodations with the course instructor as early in the semester as possible. If you have a disability that qualifies under the Americans with Disabilities Act and Section 504 of the Rehabilitation Act, and you require accommodations, you should contact the Disability Resource (DR) office for information on appropriate policies and procedures. DR is located on the main floor of the Student Services Building, Room 1076, phone 515/294-7220, web site: <http://www.dso.iastate.edu/dr/>. There you can obtain a Student Academic Accommodation Request (SAAR) form, which you must present to the course instructor at the beginning of the semester or as soon as you become aware of your needs. We require at least one week's advance notice to provide accommodation at an exam.

Harassment and Discrimination: Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, Student Assistance at 515-294-1020 or email dso-sas@iastate.edu, or the Office of Equal Opportunity and Compliance at 515-294-7612.

Religious Accommodation: If an academic or work requirement conflicts with your religious practices and/or observances, you may request reasonable accommodations. Your request must be in writing, and your instructor will review the request. You or your instructor may also seek assistance from the Dean of Students Office or the Office of Equal Opportunity and Compliance.