



Graduate Study in Condensed Matter/ Materials Physics

www.physics.utoledo.edu

Degrees offered: M. S., M. S. E., Ph. D. in physics; concentrations in astronomy/astrophysics and in materials science; joint M. S. program with Electrical Engineering and Computer Science; Ph. D. concentration in medical physics offered jointly with the Department of Radiation Oncology

Faculty: 24 in all (11 in condensed matter/materials physics)



Recently installed two-chamber system for fabrication of CdTe and related materials and solar cells.

Research

Biological physics: molecular interactions with DNA and RNA (Lee)

Materials physics (experiment): photovoltaic materials and devices: amorphous silicon (Deng), CuInSe₂ (Marsillac), and CdTe (Compaan); photoelectrochemical H₂ generation (Deng); hydrogen sorption, carbon nanotubes and related materials (Heben, Ellingson); real time metrology (Collins)

Materials physics (theory): computational study of materials, surfaces, and interfaces (Amar, Khare); disordered systems (Khare, Karpov); non-equilibrium systems and thin-film growth (Amar); phase transition kinetics and thin-film photovoltaics (Karpov); quantum many-atom systems (Gao)

Optical physics: integrated optics and non-linear optics (Bagley, Deck); spectroscopic ellipsometry and polarimetry (Collins)

On-campus research facilities

Materials and device fabrication: systems for physical and chemical vapor deposition (CVD) of thin films, including magnetron sputtering, molecular beam epitaxy, plasma enhanced CVD, and hot wire CVD

Materials and device characterization: optical analysis including transmission, reflection, photoluminescence, and Raman spectroscopy, spectroscopic ellipsometry, magneto-optical Kerr effect; structural analysis including scanning tunneling, atomic force, and scanning electron microscopy; and electronic analysis including current-voltage, capacitance, Hall effect, and quantum efficiency

Computation: Two Beowulf computer clusters; access to the Ohio Supercomputer Center; and Internet 2

Collaborations with regional industrial and government laboratories

CdTe solar cell production (First Solar, Perrysburg, OH); a-Si:H solar cell production (United Solar Ovonic Corp., Auburn Hills, MI); space photovoltaics, quantum dot devices (NASA Glenn Research Center, Cleveland, OH)

Administrative

For admission: Undergraduate GPA 2.7 or better. Provide official transcript and 3 letters of recommendation. GRE General required, Physics subject test encouraged. *Deadline:* Applications for fall should be complete by mid-January in order to be considered in the first round. *International students:* TOEFL \geq 213 or equivalent.

Assistantships: Stipend is competitive; tuition is waived. **For more information & to apply:** www.physics.utoledo.edu
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14 May 2008