



Center for Lasers and Plasmas for Advanced Manufacturing (LAM)

Old Dominion University

Shaping the future of manufacturing through advances in laser and plasma research

A National Science Foundation Industry/University Cooperative Research Center since 2001

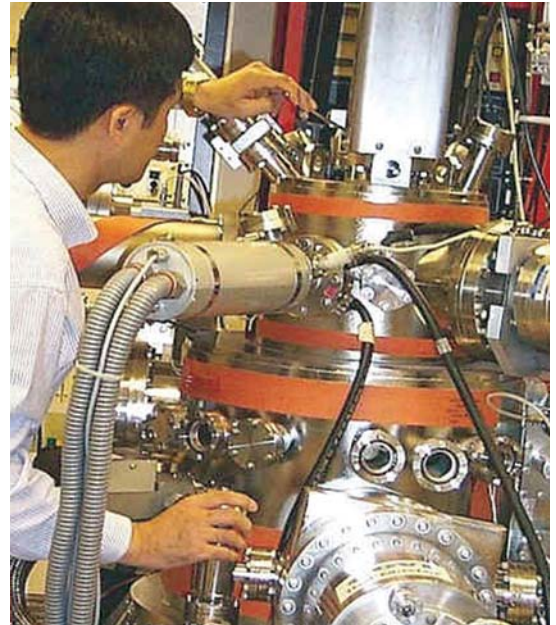
Center Mission and Rationale

The mission of the Center for Lasers and Plasmas for Advanced Manufacturing (LAM) is to develop a science, engineering, and technology base for laser and plasma processing of materials, devices, and systems. The Center is building on existing research being conducted in plasma and photon processing by Old Dominion University at the Applied Research Center (ARC). The university has the requisite expertise and equipment, valued in excess of \$4 million, to pursue research and development in this area. The Center provides a core technology base in lasers and plasmas, support for the creation and growth of innovative collaborations among industry partners, and the opportunity to enhance existing research relationships with neighboring federal laboratories.

Research Program

Faculty and students from the College of Engineering and Technology are currently conducting sponsored research in:

- Femtosecond laser applications
- Laser processing of materials
- Laser micro-machining and welding
- Thin film coatings
- Biomedical applications of lasers
- Plasma technology
- Optical sensors and laser processing
- Carbon nanotubes and nanocomposites
- Advanced photolithography
- Electro-optic devices.



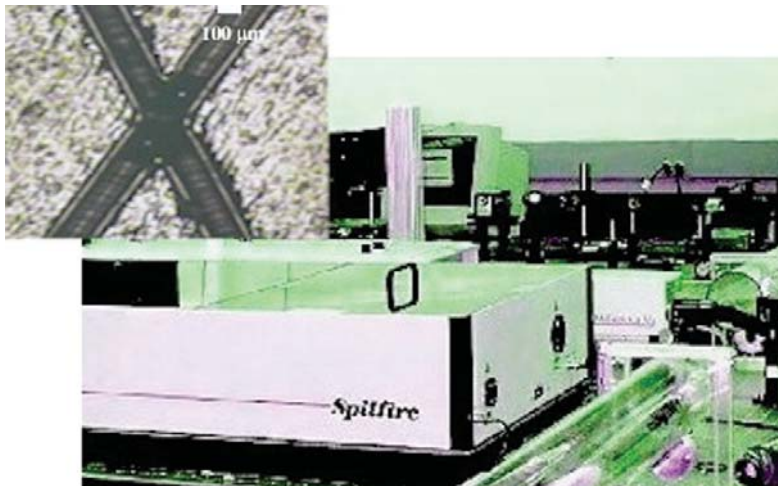
Ultrahigh vacuum thin film deposition system with *in-situ* characterization capabilities.

The Center's goal is to advance research in these areas as well as those identified by our industry partners. These would include additional uses of the Center's capabilities in, for example, advanced laser research, thin film growth, carbon nanotubes, nanocomposite materials advancement, *in-situ* laser diagnostics, and plasma technology.

Special Center Activities

In addition to research activities, Center personnel are actively engaged in knowledge and information transfer. At the ARC, Old Dominion University counts among its partners some of Virginia's finest materials scientists. The Center will also build upon a number of projects at the ARC supported by funding from the federal government, industry, Virginia's Center for Innovative Technology, and the state government. The Center will take full advantage of its immediate proximity to NASA Langley Research Center and the Free Electron Laser (FEL) Facility at the Thomas Jefferson National Accelerator Facility. Jefferson Lab's FEL is the world's most powerful tunable laser, currently delivering kilowatts of average power in the mid-infrared.

Some of the world's most advanced apparatus are at the Center's disposal. These include the following:
1) *Lasers:* Nd:YAG, carbon dioxide, ruby, excimer, argon ion,



State-of-the-art femtosecond laser facility (supported by National Science Foundation) and a laser micromachined component (top left).



Atmospheric plasma source for large area materials processing

- high power diode, femtosecond Ti:sapphire, and tunable dye laser
- 2) *Surface Coating Systems*: multi-target sputtering, chemical vapor deposition, electron beam, ultrahigh vacuum, plasma and ion beam deposition, and etching systems for coating metals, dielectrics, semiconductors, and other films
 - 3) *Materials Analysis Systems*: optical, scanning electron, and atomic force microscopes; X-ray diffractometer, low-energy electron diffraction (LEED); quadruple mass spectrometers (QMS); and micro-Raman spectrophotometer.



The Applied Research Center (ARC) at Old Dominion University

Together with its partners in industry, academia, and state and federal laboratories, Old Dominion University is setting a new standard in research and development and deployment of entirely new classes of applications and products using lasers and plasmas in the manufacturing process.

Center Headquarters

Center for Lasers and Plasmas for Advanced Manufacturing
Old Dominion University
Applied Research Center
12050 Jefferson Avenue, Suite 721
Newport News, VA 23606
Tel (757) 269-5645 • Fax (757) 269-5644
Homepage: www.arc.odu.edu

Center Director: Dr. Mool C. Gupta
mgupta@odu.edu

Center Evaluator: Prof. Donald D. Davis
(757) 683-4461 • dddavis@odu.edu