



New Netzsch LFA 457 Laser Flash System installed and operational in C24



Pulsed Electric Current Sintering (PECS) System installed in C24 ERC.

DEPARTMENT OF ECE
ELECTRICAL AND COMPUTER ENGINEERING

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Netzsch LFA457

The NETZSCH LFA 457 MicroFlash® complies with the latest technology for modern laser flash systems. The table-top instrument allows measurements from -125°C to 1100°C using two different user-exchangeable furnaces.

The innovative infrared sensor technology employed in the system enables measurement of the temperature increase on the back surface of the sample, even at temperatures of -125°C .

The instrument can be used for small and large sample sizes of up to 25.4 mm diameter and, with the integrated sample changer, measurements can be run on several samples at the same time. The vacuum-tight design enables tests under defined atmospheres.

The vertical arrangement of the sample holder, furnace and detector simplifies sample placement and, at the same time, guarantees an optimum signal-to-noise ratio of the detector signal. Text taken from < www.netzsch.com/en/home/>

Measurements of thermal diffusivity and CP are available. Additional information and experiment request can be found at www.egr.msu.edu/erc-cleanroom/equipment/Netzsch/

Pulsed Electric Current Sintering (PECS)

This Pulsed Electric Current Sintering (PECS) system is a hot pressing system which heats the sample and die by sending a pulsed electric current through the die and sample. This strongly localizes the heating, and provides rapid heating of the sample.

The result of such a configuration is the rapid fabrication of pressed samples in minutes as opposed to hours. This helps to minimize grain growth during pressing, and can result in improved mechanical and electrical properties of the samples. Text taken from < www.thermaltechnologyinc.com/>.

Additional information and experiment request can be found at www.egr.msu.edu/erc-cleanroom/equipment/sps/

New Equipment Efforts

Researchers associated with the ECE Cleanroom are actively pursuing new equipment to support research and education of the cleanroom users.

Current and developing micro and nano-engineering research activities utilizing the ECE Cleanroom can be organized into five areas including: (1) carbon-based technology, (2) microwave plasma technology, (3) MEMS and microfluidics technology, (4) manipulation and probe technology for micro and nano applications, and (5) miniaturized millimeter wave and optical systems. The proposed equipment acquisition described below is part of the facility's multiyear strategy to improve its capabilities, which will facilitate research activities and student training in these five areas. In developing this equipment list below, we have considered the availability of similar instrumentation on campus and the capabilities of such instrumentation.

Deep Reactive Ion Etch (DRIE) System

Secondary Ion Mass Spectroscopy (SIMS) System

Reactive Ion Etch (RIE) System

Mask Aligner with simultaneous front and backside alignment capability

These instruments would have significant impact for ongoing and future research, and would expand the campus facilities with capabilities that are presently not available. The DRIE and SIMS systems are not presently available on campus, and the RIE and backside alignment mask aligner would advance present capabilities with new dry etching gasses, and provide a mask aligner with simultaneous front and backside alignment capabilities that do not presently exist on campus. Continuous improvement of the instrumentation through such efforts is an ongoing and multipronged approach to seek support and donations to the facility.



Some ECE Cleanroom Rules

- All Cleanroom users are required to pass the "ORCBS Chemical Hygiene and Laboratory Safety" course which includes the hazardous waste training.
- Goggles or face shield must be used at all times when working in the hoods. This applies even if no chemicals are being used. Others might have chemicals in the hood, or residual chemicals may exist which could cause harm.
- No makeup shall be worn inside the cleanroom.
- No samples, beakers, or notebooks are to be left in the room/hoods unattended w/o being properly labeled. You must label them with your name, the date, their contents and when you will return for them. Items left unattended/unlabeled will be disposed of immediately.
- Food and drinks are prohibited in the cleanroom. Chewing gum is not allowed in the cleanroom.
- All cleanroom equipment usage must be entered in the respective logbook. Your entry into the logbook must include: Your name, the date, your advisor's name, the time you began, the time you finished, your signature, comments on the operation of the equipment (including any difficulties you experienced before, during, or after you finished using the equipment), and the chemical and/or gas usage.

This is a short list of the rules. All rules can be found at www.egr.msu.edu/erc-cleanroom/rules/

"If a cluttered desk is the sign of a cluttered mind, what is the significance of a clean desk?"

Dr. Laurence J. Peter

Equipment Status

Suss Mask Aligner – The mask aligner is currently online. The lamp exposure power needs to be adjusted. The working wavelength is 265nm to 350nm. Because of this wavelength it is not useable for SU8 photo resist. If you are using SU8 please contact Karl or email eceshop@egr.msu.edu to setup a time to use the mask aligner in the teaching lab.

PECVD System – The PECVD system is on-line and over the summer we discovered there is a heat issue in the control board design from Oxford. So if the AC is out in the cleanroom it is best to wait to use the PECVD system. We also had to have the RF power supply repaired over the summer and this has left an unresolved issue using the low frequency. This is planned to be repaired.

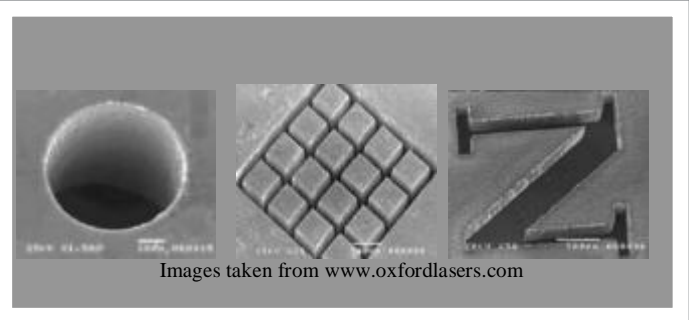
PVD System – The PVD system is online. Several issue were taken care of over the summer and fall which has made the system more reliable. WE continue to work on the system and need to repair the CM gauge. We just added O2 to the PVD and replaced the flow meter.

RIE System - This system is just old and we need to keep a constant eye on it. We have been having a problem with the roughing vacuum pump and an oil leak. This repair is ongoing. We thought we had resolved the problem with users not being able to get a DC bias across the sample but this problem has re-appeared and we are trying to find the correct fix. Vacuum leaks as well continue to be a problem and are being worked on.

Clean room AC – The AC system in the cleanroom is still being looked at and repaired. This has been an ongoing problem and at this point Physical Plant, FTC&H, Siemens, ECE Staff and Leo Kempel are all involved. Several issues have been uncovered that were not installed properly during the cleanroom upgrade and are being corrected. The problem with the humidity control has been identified and a solution is being discussed, unresolved is who is going to pay for the fix.

Laurel Spinner – We have purchased a replacement keypad to fix the broken buttons. We also purchased a smaller sample chuck at has a 3mm o-ring.

Equipment status is always available at the cleanroom web site or email eceshop@egr.msu.edu for system details



Laser micro-machining system

Using Dr. Hogan's pulsed excimer laser we are in the process of building a micro machining/cutting system. A XYZ stage, controller, and software has been identified and ordered. Cost for this system was split among several faculty members in the department. The optics needed to shape the laser beam have also been identified and ordered, again with Dr. Grotjohn's diamond SPG grant helping to cover the cost.

Some testing and figuring out all the details will need to be done once all the parts arrive. Several researchers should be able to make use of this system and we hope to use them to do some of the testing. The plan is to be able to laser machine just about any material. Polymers, Silicon, and diamond are some of the first targeted materials.

Once everything is installed and tested the system will be made available to other researchers in the University for a small sample fee to help cover the cost of the operation.

In addition, to the micro-machining we would like to get the Pulsed Laser Deposition (PLD) system back up and running which uses the same laser. With some planning the single laser will be used for each system making the best use of equipment. Again, the PLD system would be made available to researchers at a small sample fee to cover the cost of operation.

"For every problem there is a solution which is simple, clean and wrong."

Henry Louis Mencken

ECE Cleanroom and Testing Facility

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Basic Cleanroom Etiquette

Cleaning - One of the most effective ways to keep a lab safe and increase productivity is to keep it clean. Pathways should be clear, table tops should be clean, and chemicals should be kept in the proper storage place. It is very frustrating to have to clean an instrument before you use it because someone else left it dirty. Having to search for or make new solutions of chemicals that have not been put away correctly wastes time and chemicals. Be courteous and clean up your own space. It is your responsibility to clean what you use. Before leaving the cleanroom, you should also do a quick check of all the areas you worked in to insure you do not inadvertently leave things out of place.

Labeling - Unlabeled chemicals are significant environmental and health hazards. When you make up a solution, remember to label it. When labeling a solution, you should include the following: **Fullname, date, full chemical formula**

Preparing - Cleanroom equipment often requires long periods of usage. Be courteous to others who may want to use the same equipment. Before you begin, know what you are going to do and what you need. Proper planning of your tasks saves time, increases safety, and prevents damage to the equipment.

Commonsense and Common Courtesy - The most important parts of housekeeping and cleanroom etiquette are common sense and common courtesy. Lists should not be necessary for much of the behavior expected in the cleanroom. Obviously, there should be no horseplay in the cleanroom. If you deplete a squeeze bottle of a frequently used chemical, refill it. If the supply of a chemical is getting low, let the lab manager know so that more may be ordered. Basically, follow the "golden rule" and think about what you are doing.

Information above taken from <cleanroom.byu.edu/etiquette.phtml>

Additional information about the cleanroom or testing facility please contact the following

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