UW, Micron Today Launch Materials-Testing Lab in Quest for Next-Generation Microchips

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Seattle, WA , Monday, March 19, 2007 – The computer chip industry is facing a predicament: as chips get smaller they are reaching a physical limit. Today's semiconductor devices are made of parts containing just a few hundred atoms of silicon and other materials. As consumers demand even faster and smaller devices, nano-scale effects will change the materials' behavior.

"Silicon is still an absolutely good material for the active area, where the electrons travel," said lab director Fumio Ohuchi, a professor in the Department of Materials Science and Engineering. "But the supporting material, the surrounding scaffold, will have to change as we're pushing the technical limit. Smaller devices will require new combinations of materials."

Finding these materials is the first goal of the University of Washington's new Micron Laboratory for Combinatorial Materials Exploration. The lab opened its doors today in a ribbon-cutting ceremony at the UW. Boise-based Micron Technology, Inc., manufacturer of memory chips and image sensors, and the Micron Foundation helped launch the new lab with more than $400,000 in equipment and $500,000 in cash.

"The laboratory will allow us to conduct collaborative research leading to faster, more efficient and cost-effective screening of new materials," Ohuchi said.

The lab is part of Micron's university-relations efforts to advance education, primarily in science and engineering, by establishing strategic partnerships with premiere research universities.

"In order to compete in the fast-paced micro-electronics industry, Micron must continue to innovate and execute on the cutting-edge, material science technologies of tomorrow," said Scott DeBoer, Micron's director of process development. "By collaborating with the UW on combinatorial materials, we have a unique opportunity to enhance advanced research activities and findings that continue to drive material development efforts and digital technology innovation."

Today's silicon-based transistors, used in all computer processors and memory chips, Ohuchi said, are predicted to be obsolete by 2025. New materials will be required to combine optical and magnetic signals, two directions for future microchips, with the existing silicon electronics. At the moment many different possible successors are vying for favor. Testing them all quickly is beyond the ability of conventional materials testing, Ohuchi said.

The Micron lab's machines automate materials testing by creating a wafer, called a materials library, whose properties change gradually. By layering these wafers, a single test can evaluate all possible combinations of important factors – such as manufacturing process, material composition and atomic structure – to see which produce the best attributes. The word "combinatorial" in the lab's name refers to this system for combining different materials.

Similar techniques for screening candidates have long been used in the pharmaceutical industry, but are only beginning to be used in materials research, Ohuchi said. The new lab will work cooperatively with other institutions using combinatorial materials testing, including the National Institute of Materials Science in Japan, the Pacific Northwest National Laboratory in Richland, Wash., and the University of Maryland in College Park. Materials scientists predict that the abundance of data generated by this type of screening will have the same effect on their field that the Human Genome Project had on biology.

The lab will be directed by a multidisciplinary team of five UW faculty. In addition to Ohuchi, physicist Marjorie Olmstead will help to assess why the material responds in certain ways. Materials scientist Raj Bordia will study whether the combinations are compatible and stable. Electrical engineers Bruce Darling and Scott Dunham will conduct modeling experiments and build prototype devices. The fast pace of today's computer industry means research once carried out in many steps, Ohuchi said, is now being done simultaneously.

"The Micron lab will provide a total integration of expertise within the University of Washington to speed up material development," said professor Alex Jen, chair of the Department of Materials Science & Engineering.

"This investment will also build much tighter relationships with our neighboring semiconductor companies."

All results will be collected in a publicly accessible computer database. While the initial motivation for the lab is to test semiconductors for the computer industry, over time it may be used to test new materials for energy and environmental uses, such as components for solar cells and fuel cells, or to discover replacements for dwindling resources, such as the indium used in flat-panel display screens, Ohuchi said.

"We want to have a global impact," he said. "Together we hope to become a nucleus for research and also education, preparing students for the workforce of tomorrow."

The Micron Technology Foundation, Inc., a private, non-profit organization established in 1999 with a gift from Micron Technology, Inc., is engaged in funding educational efforts and charitable activities. To learn more about the Micron Technology Foundation, visit its Web site at www.micron.com/foundation.

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Contacts

Hannah Hickey
Washington University
(206) 543-2580
hickeyh@u.washington.edu

Jill Thompson
Micron Technology
(208) 368-5749
jtthompson@micron.com