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## **Nanomanufacturing Research Center Connects With Industry**

AMHERST, Mass. — This week at a convention hall in Phoenix, alongside trade show booths promoting the wares of electronics firms, chemical companies and equipment vendors, Dr. Jeffrey Morse of the University of Massachusetts Amherst Center for Hierarchical Manufacturing (CHM) will be passing out brochures and chatting up technology executives to introduce them to technologies coming out of UMass labs. It's all part of the center's industry outreach effort to engage companies in supporting research, collaborating on technology development, and licensing technologies flowing from the center's research in nanomanufacturing. This week, Morse is posted at Booth 18 at the Flexible Electronics & Displays Conference, where the focus is on technologies for flexible, printed electronics and electronic displays. UMass is one of only a few academic exhibitors at this industry event, so it gets a good opportunity to speak with business attendees and R&D managers strolling the show floor.

The CHM's technical focus on what is known as roll-to-roll nanomanufacturing—or in the current lingo, “R2R”—is a reason why companies are interested in what is happening at the laboratories back in Amherst. “We are taking a time-tested manufacturing approach—volume production on continuous rolls of a flat substrate, just like New England paper companies have done for the last 200 years—and coming up with ways to fabricate intricate structures and devices with feature sizes at the scale of nanometers,” says Prof. Jim Watkins, director of the CHM. He points out that industry is hungry for roll-to-roll technologies that work at factory scale, conceivably making it possible to reduce the cost of high-tech devices to small fractions of a penny. Watkins' own research includes using specially-engineered tools and innovative technologies to mix solutions of polymers and nanoparticles that self-assemble to form sub-microscopic device structures. He is at the flexible electronics conference presenting a new approach to fabricating floating gate memory devices using these roll-to-roll coating techniques.

In addition to electronic and energy devices such as solar cells, sensors, antennas, memory, displays, supercapacitors and batteries, many other functional materials such as barrier layers, security films, transparent conductor layers, magnetic metamaterials, chem/bio shielding, superhydrophobic surfaces, filtration/separation membranes and other products incorporating nanotechnology-on-film can be made by roll-to-roll nanomanufacturing.

In the past year Watkins, Morse and others from the CHM team have made important inroads in exposing to industry the center's unique materials chemistry approaches to the roll-to-roll nanomanufacturing challenge. Several companies have signed up for a ‘Roll-to-Roll Processes’ industry consortium program, one of a number of technical clusters for closely observing materials-related scientific progress at UMass organized through the Center for UMass-Industry Research in Polymers (CUMIRP). The center launched a new website, [r2nano.org](http://r2nano.org), to get the word out about roll-to-roll nanomanufacturing to industry, and has research contracts out with several companies interested in particular R&D challenges. The CHM is supported by the National Science Foundation as one of the nation's Nanoscale Science and Engineering Centers, with an industrial advisory board composed of representatives from twelve companies. Morse, whose role in the center is managing director of the CHM's National Nanomanufacturing Network (NNN), a technical information clearinghouse and networking service for the U.S. nanomanufacturing R&D community, was recently named one of the 25 “Most Influential Nanotechnology Leaders” by the NanoBusiness Commercialization Association. An NNN technology roadmap for roll-to-roll nanomanufacturing, spearheaded by the UMass Amherst team, will be released in early 2012.

“We think this is the way to engage with companies, getting out to where they are not only at academic conferences but also at industry events, because for the kinds of impact that this center is capable of making, we need industry as a partner, and they need to see us as speaking their language,” says Morse.

**Contact:** Mike Wright, 413/687-7787, [wright@research.umass.edu](mailto:wright@research.umass.edu)