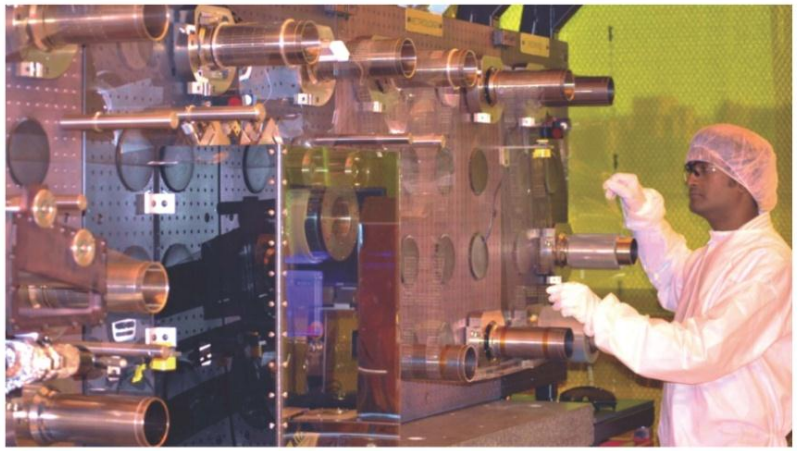
Formation of Pre-Competitive R2R Research Consortium

Launched in 2011 as part of the Center for University of Massachusetts / Industry Research on Polymers (CUMIRP), the precompetitive industry research consortium for Roll-to-Roll Processing designated as Cluster R has grown to seven industry members.

Member meetings were held in the spring and fall and a dedicated “Member Only” website for disseminating reports and receiving member input was set-up.



Cluster R

Roll-to-Roll Processing

Center for UMass-Industry Research in Polymers (CUMIRP)

A pre-commercial research consortium exploring the science of nanostructured flexible device manufacturing on large-format roll-to-roll platforms

Joining UMass Amherst's **Cluster R** industry consortium for roll-to-roll processing research is an efficient way to leverage innovation in advanced coating and printed electronics at a national nanotechnology research center. We focus on the fabrication and characterization of polymer-based nanostructured materials, hybrid nanomaterials and templates on scaled, flexible substrates via roll-to-roll (R2R) process platforms.

Cluster R research expertise includes synthesis of polymer and polymer-nanoparticle systems, self-assembly of complex nanostructures, process modeling, control, and characterization for high-throughput, flexible substrate processing platforms. Methods studied within this cluster include roll-to-roll UV-assisted nanoimprint lithography to prepare substrate patterns with features on the order of 100 nm and below, nanotextured substrates, and continuous patterning of device level features on a web. The cluster also takes advantage of additive-driven self-assembly to prepare well-ordered hybrid materials in which polymer templates guide the assembly of nanoparticles, nanotubes, fullerenes and other materials to produce functional device layers that can be applied via R2R coating techniques.

Combining top-down and bottom-up nano-manufacturing approaches on high-volume R2R enables synthesis and fabrication of complex nanostructured materials and devices over large areas at low cost.

Potential applications enabled by this technology include magnetic metamaterials, membranes (separations or selective transport), magnetic storage, sensors, displays, energy (harvesting and storage), barrier films, and flexible electronics.

Cluster R is the industry affiliate program of the **Center for Hierarchical Manufacturing (CHM)**, an NSF Nanoscale Science and Engineering Center at the University of Massachusetts Amherst specializing in nanomanufacturing. The CHM supports a roll-to-roll processing facility that includes R2R nanoimprint lithography and hybrid materials coating tools. CHM research includes demonstration projects on photovoltaic devices and flexible batteries. Cluster R leverages research contributions in the CHM from several disciplines, including Polymer Science and Engineering, Mechanical Engineering, Chemistry, Chemical Engineering, and Physics, investigating the transition of self-assembly processes adapted to scaled flexible substrates.

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