Workshop on NanofabricationTechnologies for Roll-to-Roll Processing

An Academic-Industry Workshop on Technologies for American Manufacturing Competitiveness

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http://www.internano.org/r2rworkshop

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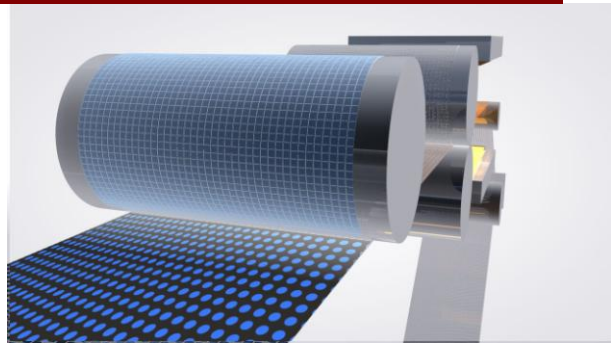
Workshop Goals:
Identify and discuss progress and challenges for successful merging of nanofabrication technologies into advanced device manufacturing. The workshop included discussions of general parameters for a multi-year technology roadmap to guide progress in roll-to-roll processing of nanoscale devices.



Technical Topics Addressed included:

- Generating low-cost, commodity-scale materials sets
- Demonstrating precision cooperative assembly
- Utilization of surface directed/guided assembly of critical features via imprint stamping
- Fabrication of ordered hybrid nanocomposites at high rates
- Nanoimprint processes
- Process integration
- Online metrology
- Global R&D efforts and developing manufacturing capabilities, especially in Europe and Asia

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Workshop participants included invited researchers, institutions, and leading companies involved in roll-to-roll processing and scalable nanomanufacturing methodologies

Jeff Morse-NNN
Dan Gamota, INEMI
James Watkins, CHM/UMass
Amit Goyal, Oak Ridge National Lab
Ken Carter, CHM/UMass Amherst
Nikolaos Kehagias, Catalan Institute of Nanotechnology
Jay Guo, University of Michigan
Jennifer Ernst, Thin Film Electronics
Robert Praino, Chasm Technologies
Rick Daniels, Carestream
Dennis Slafer, Microcontinuum
Trevor Niblock, Magzor
Michael Hunter, Liquidia Technologies
S. V. Sreenivasan, UT-Austin/Molecular Imprints
Dr. Du Xian, MIT
Joe Petrzelka, MIT
Paul Clark, CHM/UMass
Mark Tuominen, NNN/CHM/UMass
Lloyd Whitman, CNST/NIST
Gregg Gallitan. CNST/NIST
James Kadtke, NNCO
Derek Schorzman, Liquidia Technologies
David Hardt, MIT
Michael Wright, CHM/UMass
Ganesh Sundaram, Cambridge Nanotech, inc.
Hong-Yee Low, ASTAR/IMRE
Mark Poliks, CAMM
George Raniuk, Carpe Diem Technologies

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Guiding Questions for Workshop Presenters and Participants

What are the biggest barriers or process bottlenecks that need to be addressed to realize roll-to-roll nanomanufacturing?

Can you foresee enabling / emerging technologies that need to be developed in order to realize roll-to-roll nanomanufacturing?

Are there specific materials and/or metrology needs that are needed to realize roll-to-roll nanomanufacturing?

What infrastructure needs to be developed to transition roll-to-roll technologies to volume manufacturing?

What sorts of partnerships (public, private, academic, consortia) are needed to accelerate progress towards volume manufacturing?

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Workshop Outcomes

- Input still being compiled for report, themes emerging include:
  - Standards efforts are critical
  - Metrology remains a challenge
  - Process modeling and control needed
  - Cluster type public private partnerships desired
  - Materials remain limited
  - Vacuum/thermal processes limited

- **NIST AMTech industry consortium program public comments**
  - Opportunity for further comment/input regarding manufacturing consortia models

- Next workshop being planned: Input/Comments?

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