

UMass Life Sciences Task Force: Nanotechnology Working Group Update

Co-Chairs:

*Stephen McCarthy, UMass Lowell
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*Jeff Brancato, UMass President's
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Nanotechnology Working Group

- *Stephen McCarthy, Lowell (co-chair)*
- *Lakis Mountziaris, Amherst (co-chair)*
- *Richard Antonak, Boston*
- *Jeff Brancato, President's Office*
- *Paul Calvert, Dartmouth*
- *Todd Emrick, Amherst*
- *Rudolf Faust, Lowell*
- *Doug Golenbock, Worcester*
- *Zhiyong Gu, Lowell*
- *Shaw Ling Hsu, Amherst*
- *Eicke Latz, Worcester*
- *John Mordes, Worcester*
- *Lakis Mountziaris, Amherst*
- *Bob Nicolosi, Lowell*
- *Babs Soller, Worcester*

Working Group Activities

- *Inventory of nanoscience and engineering research related to the life sciences:*
 - *Building a searchable database (expertise keywords, research projects, publications, patents, etc.);*
 - *Identification of relevant research centers (CHM, MRSEC, CUMIRP, CHN, NanoMedicine Inst., etc.);*
 - *Designed to be web-based and available to researchers, partners, policymakers and other stakeholders;*
 - *Begin with working group members and expand across each campus.*

Nano/Bio Related Centers

- *Center for Hierarchical Manufacturing (Amherst)*
- *Materials Research Science and Engineering Center (Amherst)*
- *Center for UMass-Industry Research on Polymers (Amherst)*
- *Center for High-rate Nanomanufacturing (Lowell)*
- *Nanomanufacturing Center of Excellence (Lowell)*
- *Nanomedicine Institute (Amherst-Worcester-Lowell)*
- *Center for Health and Disease Research (Lowell)*
- *Center for Complex Environmental Systems (Lowell)*
- *Center for Advanced Materials (Lowell)*
- *Massachusetts Medical Device Development Center (Lowell-Worcester)*

Nanotechnology for Tissue Engineering – Polymer Scaffolds

- **Electrospun nano fibers and web formation from various polymeric solution or melts. These nanofibers (diameter ranging from 40 nm -200nm). 3D digital printing of modified fibrous substrate to enhance ink-reception. The ink can be any bioactive or bio materials including cells. Scaffolds for cartilage replacement therapy.**
- *UMass Dartmouth - Kim, Fowler, and Calvert*
- *UMass Lowell - Chen and McCarthy*
- *UMass Amherst - Crosby, Bhatia, Tew, Santore*

Nanotechnology for Drug Delivery- Polymer Encapsulation and Self Assembly

- ***Self-assembling nanoemulsions for the delivery of pharmaceuticals.***
- ***Hydrophilic molecular self-assembly of fullerene-derived nanospheres as biologically active free radical scavenging agents and PDT drugs.***
- ***Polymer coatings for drug eluting coronary stents***

- ***UMass Amherst - Bhatia, Bermudez, Hayward, Santore, Rotello and Winter***
- ***UMass Lowell - Nicolosi, McCarthy, Chiang, and Faust***

Nanotechnology for Tumor Treatment

- ***Targeted intratumoral delivery***
- ***Using an antibody to a tumor marker attached to a supraparamagnetic nanoparticle and magnetic field we can with precision selectively kill human cancer cells in vivo in a mouse model while sparing surrounding normal tissue.***
- ***Reactive nanocomposite heaters.***

- ***UMass Lowell - Chen and Braunhut***
- ***UMass Amherst - Forbes***

Nanotechnology for Antimicrobial Applications

- ***Bioavailability and toxicity of nanoparticles to microbial communities. Molecular self-assembly of fullerene-derived nanospheres as antibacterial agents. Antimicrobial textiles***
- ***UMass Amherst - Ergas, Tew, Santore***
- ***UMass Dartmouth - Fan***
- ***UMass Lowell - Rooney-Varga, Zhang, and Chiang***

Nanotechnology for Biosensors

- ***Point-of-Care Diagnostics using fluorescent nanostructures***
- ***Diagnostic tools to analyze immune stimulatory activities in patient fluids***
- ***Nanomaterials for enhancing protein analysis in complex mixtures***

- ***UMass Amherst - Mountziaris, Davis, Maroudas, Emrick, Bermudez, Barnes, Dubin, Kaltashov, Thayumanavan, Watkins, Russell, Santore, Vachet, and Rotello***
- ***UMass Worcester - Latz***
- ***UMass Lowell - Sandman, Gu***
- ***UMass Dartmouth- Calvert***

Nanotechnology for Blood Purification

- ***Development of magnetic nanoparticles that selectively bind to viruses in blood and allow separation by a magnetic field***
- ***UMass Worcester – Finberg, Latz***
- ***UMass Amherst – Rotello, Emrick, Mountziaris***

Nanotechnology for Vaccine Development

- ***Engineered nano-carriers are used to develop a new vaccine technology for the malaria parasite***
- ***UMass Worcester – Golenbock, Latz***
- ***UMass Amherst – Bhatia, Bermudez, Emrick, Dubin, Kaltashov, Thayumanavan, Watkins, Russell***