

Multi-scale Manufacturing with Polymer Materials

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Why Polymer Nano?

- Lightweight and conformal
- Multiple materials can be integrated
- Processed in high rate, low cost manner
- Wide range of applications

World Class Polymer Manufacturing



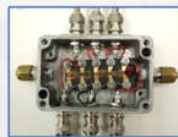
Responsible Nanomanufacturing

Nanoparticle exposure,
 Nanotoxicity, Recycling



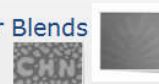
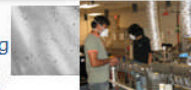
Products We are Helping to Make

- Coatings
 - to de-ice airplane wings (icephobic)
 - anti-microbial for medical & consumer products
- Sensors to determine biological or chemical threats in battlefield
- Lab on a chip
- EMI shielding materials
- Self-cleaning surfaces (eyewear, windows, etc.)
- Cloaking: Low observable material

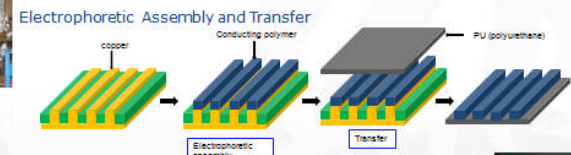


Polymer Nanomanufacturing

- Polymer Nanocomposites
 Commercially relevant melt mixing
- Nanolayers by Coextrusion
 Continuous production of films with 2000+ layers
- Nanofeatures by Injection Molding
- Directed Assembly of Polymer Blends
- Nanofibers

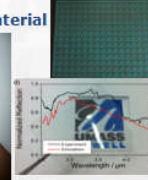


Directed Assembly and Transfer



Scaling to Roll to Roll

Chiral Metamaterial



L. Fang et al., Microelectronic Engineering 107 (2013) 42-49