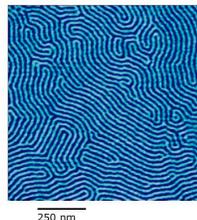


Lithographically Assisted Hierarchical Self-Assembly

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Motivation and Background

- Top-down assembly is rapidly approaching its limits
- Bottom-up assembly cannot produce long-range order
- Merging these two methodologies transcends the limitations of both
- Ultrathin diblock copolymer films are promising candidates for nanotemplates in hybrid organic-inorganic devices
 - Self-assemble into microphase separated domains on the nanoscale
 - Without further constraint, these domains are disordered

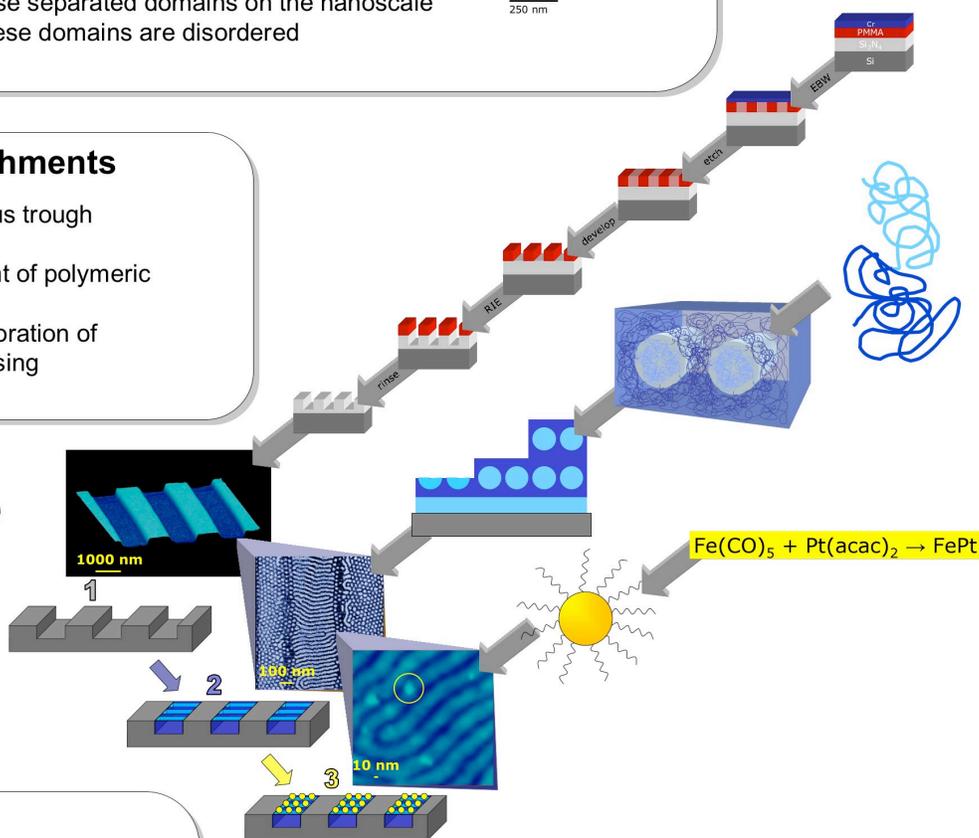


Major Accomplishments

- Prepared substrates with various trough dimensions
- Achieved near perfect alignment of polymeric nanoscale domains
- Initial results with selective decoration of nanoparticles have been promising

Hierarchical Scheme

1. Substrate with lithographically prepared channels
2. Polymeric domains aligned within channels
3. Magnetic nanoparticles selectively decorating polymer

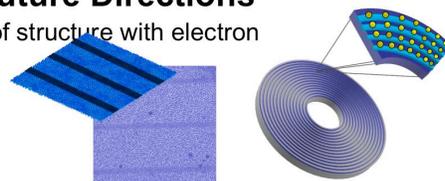
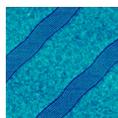


Impact

- Sensor technology
 - Palladium nanowires for hydrogen sensing
- Electronics
 - Conducting or semiconducting nanowire arrays
- Spintronics
 - Incorporating spin into devices
- Catalysis
 - Extremely high surface area materials

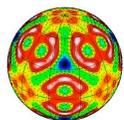
Future Directions

- Adding 2nd layer of structure with electron beam writing



- Next-generation magnetic storage media
- Altering the alignment scheme

D. Sundrani, S.B. Darling, S.J. Sibener, *Nature* (2003) Submitted.



BES - DOE

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