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## NON-CONFIDENTIAL TECHNOLOGY DISCLOSURE

### Rapid 3D Patterning of Nanoparticle Materials Using Direct Incident Beam Lithography

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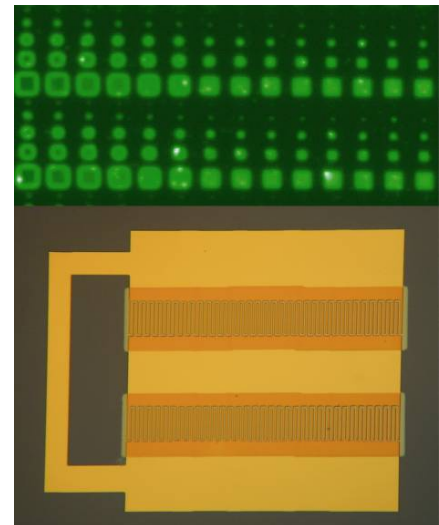
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#### TECHNOLOGY DESCRIPTION

This technology provides a simple, “direct-write” method to generate three-dimensional (3D) lithographic patterns of various nanoparticle materials such as metal, semiconductor, insulator and magnetic materials. In contrast to the standard electron beam lithography, which requires a multi-step process to pattern micro- or nano-structures on surfaces, this technology allows for a single-step patterning of a wide variety of nanoparticle films for the fabrication of 1-3D features in the nano-micro length scale.

#### ADVANTAGES

- **Simple and rapid patterning process:** 3D features such as raised portions and bridges can be fabricated in a single “direct-write” step.
- **Multiple writing modes:** Serial, parallel or a combination of serial and parallel writing modes can be used to fabricate desired 1-3D features.
- **Broad applicability:** This technology can be used to pattern a wide variety of nanoparticle materials such as metal, metal oxides, metal alloys, semiconductor, insulator and magnetic materials with a wide choice of ligand systems such as thiols, phosphates, amines, pyridines, etc.
- **High flexibility and utility in nano/micro-fabrication:** Various flat substrates or three-dimensional templates can be used in nano/micro-fabrication to generate complex 3D product structures via sequential structure formation.



#### APPLICATIONS

- **Magnetics:** Patterned media for hard disk drives; hard magnetic materials for motors and generators; route to good spring-exchange materials; patterned soft magnetic materials for RF/micro electronics.
- **Photonics/Plasmonics:** NIR materials and applications; plasmonic waveguides, horns and devices; polarizers and filters.
- **3D structures for electronics and MEMs/NEMs:** RF MEMS/NEMs such as inductors, switches, antennas, resonators, transmission lines, actuators, valves, Hall voltage sensors, tunneling magnetometers; RFID tags; electrodes and metal lines.

#### ABOUT THE INVENTORS

The inventors of this technology represent a multi-disciplinary team of distinguished UMass Amherst researchers with well-established expertise in applying synthetic chemistry and physics to the fabrication of nanoscale devices and materials such as read-write systems, molecular wires, transistors, logic gates, magnetotransport devices, energy conversion devices, electrochemical sensor arrays, etc.

**BUSINESS OPPORTUNITIES:** Available for Licensing or Sponsored Research

**DOCKET:** UMA 07-39

**PATENT STATUS:** Patent Pending

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