

Improved Projection Exposure System for Fabricating Nanomaterials (#5283)

A single step photolithographic projection exposure system based on multi-beam interference lithography (MBIL) for making small devices

Georgia Tech inventors have developed a single step photolithographic projection exposure system based on multi-beam interference lithography (MBIL) for making these smaller devices. The method produces periodic-structure-based nano- and micro-scale elements through a combination of direct imaging and interference between laser beams derived from the same laser. The system can produce high spatial frequency, periodic optical-intensity distributions with incorporated functional elements. This technology enables both rapid prototyping and large-scale manufacturing of photonic crystal devices, metamaterial devices, microfluidic devices, and biomedical structures. Development time is reduced by orders of magnitude, dramatically increasing fabrication speed and decreasing the cost of manufacturing photoelectronic device components.

Benefits/Advantages

- **High speed processing:** Enables rapid prototyping and large-scale manufacturing
- **Simple optics:** Nano-scale patterning achieved without complex optical systems or photomasks
- **Cost effective:** Replaces slow and expensive electron beam lithography

Potential Commercial Applications

- Dense integrated photonic circuits and systems (DIPCS)
- Biomedical materials
- Nano- and microelectronics, including etching optical/electronic vias
- Optics, including beam splitters, filters, and back-lighting elements

Background/Context for This Invention

This technology provides a transformative process for making compact periodic-structure-based electronic devices. Using gridded design rules, semiconductor versions of these devices become integral components in cell phones, flat panel displays, GPS devices, solar cells, flash memory drives, and thousands of other electronic devices. There is a continuing need to decrease the size of components while increasing power and speed. Optical lithography has allowed semiconductors to steadily decrease in size, but there are concerns that conventional optical lithography cannot provide the decreasing sizes that the industry demands. New approaches are needed to create smaller devices.

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More Information

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Publications

For more information about this technology, please visit:

<https://licensing.research.gatech.edu/technology/improved-projection-exposure-system-fabricating-nanomaterials>

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot

