TECHNOLOGY

Photoactuated Pen Arrays for Molecular Printing

OVERVIEW

Background

Scanning probe lithography (SPL) is a nanotool that is used for direct patterning of materials with nanoscale resolutions. Polymer-based pen array tools operated with diverse actuation mechanisms have recently been used to replace cantilever based SPL as means to increase printing throughput and scalability at a low cost. They typically consist of silicone based pens that rest on an elastomeric film on a rigid backing substrate and are used to directly print molecules onto a surface. However, independent actuation of each individual tip in a pen array is currently difficult to achieve. This is necessary for multiplexing applications in soft robotics and microfluidics. There still needs to be a way to direct the actuation of each pen individually.

Innovation

Researchers from the University of Maryland have developed photoactuated polymer pen arrays that can be used for nanoscale printing. By modifying the composition of Carbon Nanotubes (CNTs), the CNTs are able to effectively mix in a polymer substrate without agglomeration. When combined with precise optical actuations, this composition enables the localized printing from selected pens without actuating surrounding pens. Photo-actuation of these composites was found to produce microscale motion in response to modest illumination, with actuation efficiency as high as 200 nm/mW on sub 1 s time-scale. As a result, a number of nanoscale printing modalities have been made possible and this work presents an important step and paves the way for arbitrary control of polymer pens in massive arrays.

Advantages

· Photoactuable pens in a massive array
· Electrode free pen array which significantly reduces tool cost
· Large scale, multiplexing capabilities
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Applications

· Molecular printing
· Nanofabrication

Published article related to this work can be found here:
https://onlinelibrary.wiley.com/doi/full/10.1002/adma.201705303

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Additional Information

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PATENT STATUS

Pending

EXTERNAL RESOURCES

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