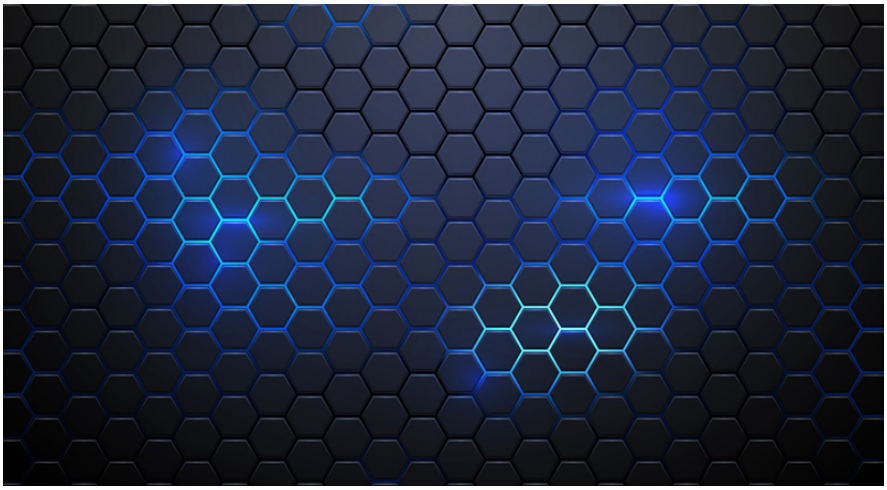
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Scalable Fabrication of Nanopatterns via Sequential Combination of Continuous One-Dimensional Nanopatterning Strokes

TECHNOLOGY NUMBER: 6790



OVERVIEW

Continuous scalable fabrication of 2D micro/nano-structures using simple patterning.

- Simplifies 2D patterning, avoiding complex lithography and masks.
- Electronics, photonics, energy conversion, bioengineering.

BACKGROUND

Two-dimensional (2D) micro/nano-structures have valuable applications across various industries, including electronics, photonics, and bioengineering. Traditional methods of fabricating these structures, such as laser interference lithography (LIL) and e-beam lithography (EBL), often involve expensive and time-consuming processes that include multiple steps like mask preparation and complex apparatus operation. These methods also face scalability challenges, which constrain cost-effective production over large areas. Additionally, unconventional lithographic techniques such as self-assembled monolayers or colloidal nanospheres offer limited scalability and require intricate post-processing steps. Consequently, there has been an increasing demand for a new, more efficient method that allows for continuous, scalable production of 2D micro/nano-patterns without these drawbacks.

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Category

Manufacturing Process
Engineering & Physical Sciences

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INNOVATION

Researchers at the University of Michigan have developed a process to continuously create 2D micro/nano-patterns on flexible substrates employing dynamic nano-inscribing (DNI) and vibrational indentation patterning (VIP). By strategically combining and utilizing these two straightforward mechanical patterning processes, it allows for rapid and scalable pattern fabrication at a lower cost. Unlike previous methods, DNI and VIP facilitate large-area patterning without the need for photomasks, significantly enhancing throughput. For instance, this approach can fabricate diverse 2D patterns, including complex "waffle-like" nanostructures, by sequential or combined use of 1D patterns. Potential applications are broad, including the development of optical films, bioengineering devices, and as templates in roll-to-roll nanoimprinting. This method's simplicity, scalability, and flexibility pave the way for advancements in applications like particle filtering, nano-scale devices, and optoelectronic components.

ADDITIONAL INFORMATION

REFERENCES

Jong G. Ok, Ashwin Panday, Taehwa Lee and L. Jay Guo, "Continuous fabrication of scalable 2-dimensional (2D) micro- and nanostructures by sequential 1D mechanical patterning processes", in Nanoscale, 2014, 6, 14636, DOI: 10.1039/c4nr05567e

INTELLECTUAL PROPERTY

US10661273 "Two-dimensional micro- and nano-pattern, methods for forming the same, and microfluidic devices formed therefrom"