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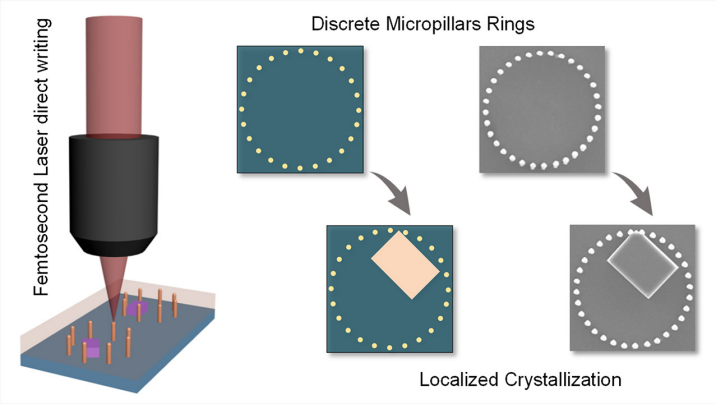
Micropillar arrays fabricated using direct, femtosecond laser writing provide a tunable and low-cost way for growing microcrystals.



The fabrication of crystals with controlled sizes in precise locations is imperative in many applications for microelectronic and micro-optoelectronic devices. However, conventional approaches generally require multiple lithography steps that make the fabrication process complex and costly.

Hu et al. developed a process that uses micropillars to control the synthesis of microcrystals via evaporation of a solution confined by what the authors called discrete micropillars rings. The DMRs, created by femtosecond laser direct writing, provide a confined environment for microcrystals to grow via capillary-assisted localized crystallization. The micropillars can then be removed using a plasma processing step, leaving the crystals grown at the specified locations.

This approach can be used for a large variety of materials both organic and inorganic, so long as those materials can be dissolved in some solvent for the liquid deposition. While this method would likely work in other cavity-type structures, such as a more conventional microhole array created using some lithographic process, the micropillars allow more flexibility in terms of removal after crystal growth and direct placement of localized structures.

The researchers tested their method with different pillar heights, spacings and cavity sizes, as well as different concentrations for the precursor solution, and documented the different types of crystals grown in each condition. For instance, they found that no extra microcrystals can be grown compared to a flat surface control when the spacing between the micropillars is larger than 3.5 microns.

Source: "Capillary-assisted localized crystallization on discrete micropillars rings," by Yanlei Hu, Yachao Zhang, Hongwei Yuan, Renyan Wang, Shaojun Jiang, Zhaoxin Lao, Guoqiang Li, Dong Wu, Jiawen Li, and Jiaru Chu, *Applied Physics Letters* (2018). The article can be accessed at https://doi.org/10.1063/1.5063608.