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Recent advances in 3D nanoprinting via focused electron beams FREE

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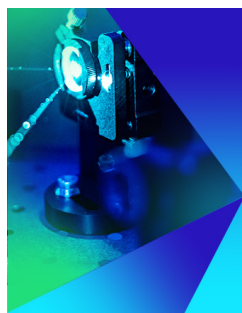


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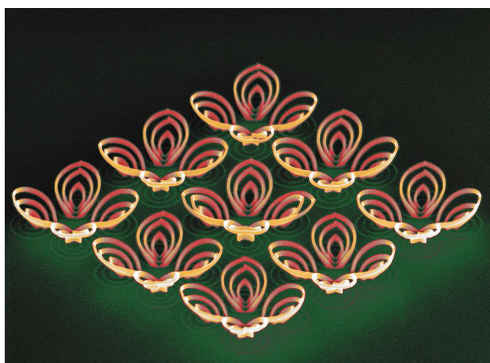


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The authors hope their perspective article about 3D-FEBID will inspire researchers to utilize this technique for its unique advantages and unexplored potential in future research and development.



3D Focused Electron Beam Induced Deposition, or 3D-FEBID, allows fabrication of freestanding complex nanoarchitectures on a wide range of substrate materials and surface morphologies, offering unique advantages compared to other additive manufacturing techniques.

Advances in recent years suggest this emerging technology has unexplored potential, such as possible applications as nanoscale probes, sensors, optics, and magnetics. Winkler et al. wrote a perspective article dedicated to the 3D-FEBID technique and where the field is heading.

The new paper outlines the basic operating principles of 3D-FEBID, which entails moving an electron beam over gaseous precursor molecules and causing non-volatile fragments of the precursor molecules to condense on the substrate. As the beam moves, more fragments condense, forming the desired structure. Users can control the position and movement of the electron beam with sub-nanometer precision and build complex structures.

First explored in the early 1990s, 3D-FEBID experienced significant improvements in recent years due to several technological breakthroughs such as computer aided design software solutions. The paper provides a comprehensive analysis of the status quo, which includes specifics of instrumental setup, materials, and other aspects. It also highlights the limitations of current practices, and provides suggestions for how to further improve the technique and expand its application.

Author Robert Winkler said that they wrote the perspective article as an introduction to the topic for researchers in and outside the field of nanoprinting, because they believe there are applications for 3D-FEBID across many fields. He hopes the it will inspire researchers looking for a new tool to use the technique in their own work.

Source: “3D nanoprinting via focused electron beams,” by R. Winkler, J. D. Fowlkes, P. D. Rack, and H. Plank, *Journal of Applied Physics* (2019). The article can be accessed at <https://doi.org/10.1063/1.5092372>.

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