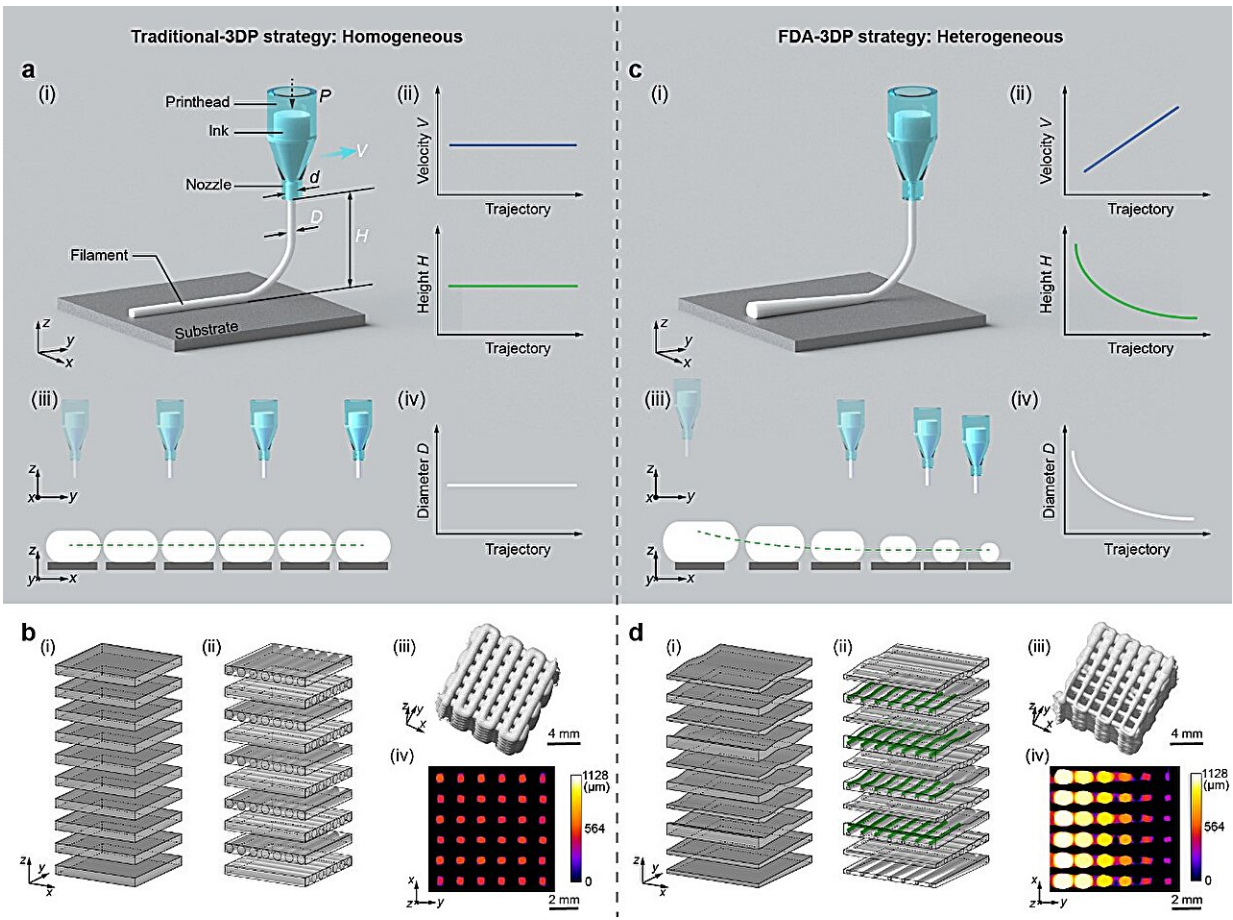


Researchers develop novel 3D printing strategy with controllable gradients porous structures

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Comparison of traditional- and FDA-3DP strategies. Credit: Ruan Changshun

Material extrusion 3D printing technology is widely utilized in biofabrication/bioprinting, tissue engineering, flexible electronics, and soft robotics. However, the fixed printing parameters and constant filament diameter limit the design and fabrication of complex gradient porous structures.

Recently, a research team led by Prof. Ruan Changshun from the Shenzhen Institute of Advanced Technology (SIAT) of the Chinese Academy of Sciences (CAS), together with researchers from the Harbin Institute of Technology, has developed a filament diameter-adjustable 3D printing (FDA-3DP) strategy for obtaining direct ink writing (DIW) 3D printed structures with controllable gradients in pore sizes using variable filling density.

The study was [published](#) in *Nature Communications* on April 4.

In this study, the researchers built a design-to-fabrication workflow from parametric model design to extrusion printing. This includes customizing the printing velocity and height along the moving trajectory to achieve precise control of the filament diameter at each location.

Experimental results show that the proposed FDA-3DP strategy enables the creation of 1D, 2D, and 3D gradient pore structures using traditional DIW extrusion 3D printers.

This work significantly enhances the processing capabilities of filament-based [additive manufacturing](#) and is expected to have broad future applications in biomimetic manufacturing and bioprinting, such as for bone, cartilage, and [blood vessels](#).

More information: Huawei Qu et al, Gradient matters via filament diameter-adjustable 3D printing, *Nature Communications* (2024). [DOI: 10.1038/s41467-024-47360-y](https://doi.org/10.1038/s41467-024-47360-y)

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