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NEWS | JULY 16 2021

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Scilight 2021, 291102 (2021)
https://doi.org/10.1063/10.0005663

AIP Publishing

Scilight

13 July 2021

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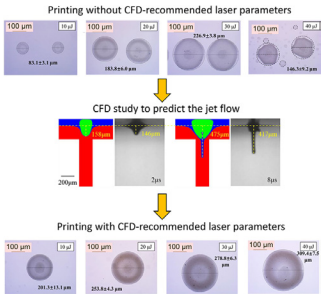
Addressing bubble dynamics and jet flow regimes leads to improved quality of laser-induced-forward-transfer bioprints.



Laser-induced-forward-transfer (LIFT) bioprinting has shown great promises because of its high precision and ability to operate free of nozzle clogging. Printing quality in current applications, however, depends highly on the bubble stability and jet flow regime, which are the keys to guarantee printing accuracy and quality.

Qu et al. developed a computational fluid dynamics (CFD) model for accurately describing the bubble formation and collapse, and the jet flow regime to improve bioprinting quality. By adopting the laser parameters recommended by the model, bioprinting quality can improve significantly by forming a stable jet regime and organizing printing patterns on the substrate.

The work marks one of the first efforts to develop a solid connection between the jet flow and the printing outcomes by utilizing the proposed CFD model to direct LIFT bioprinting.

In typical LIFT-based processes, a jet flow transfers the bioink from the ribbon to the substrate via bubble stability and jet flow development.

The group found close agreement of the CFD study with published measurements of induced jet length. They successfully printed a well-organized pattern with the letters “UT-CUMT” based on the recommended printing parameters.

“This study provides a good numerical framework for bioprinting research on how to choose the right bioprinting parameters to improve printing quality,” said co-author Ben Xu.

Xu looks to further improve LIFT bioprinting efficiency and scalability with the hopes of uncovering more insights for optimizing for cell viability and stability.

Source: “Printing quality improvement for laser-induced forward transfer bioprinting: Numerical modeling and experimental validation,” by Jie Qu, Chaoran Dou, Jianzhi Li, Zhonghao Rao, Andrew Tsin, and Ben Xu, *Physics of Fluids* (2021). The article can be accessed at https://doi.org/10.1063/5.0054675.