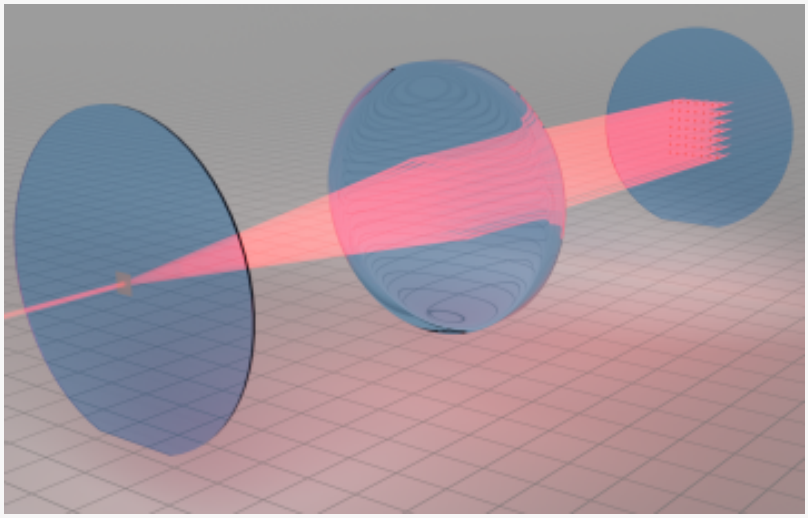
Microprinting millions in the blink of an eye

USA, April 8, 2024 /EINPresswire.com/ -- Multi-photon 3D laser printing has been sped up tenfold by using a 7x7 focus array and faster scan speeds. This new approach allows high-resolution printing of complex structures like chiral metamaterials and microparticles, opening doors for advanced materials and pharmaceutical applications. Notably, the critical micro-optical components for the setup were themselves printed using a commercial laser printer, demonstrating the versatility and potential of this technology.



We present a new setup for rapid multi-focus multi-photon 3D laser printing using a hybrid diffractive-refractive beam-splitting approach.

Multi-photon 3D laser printing has revolutionized miniature fabrication, but limitations in speed and material compatibility held it back. Now, researchers have taken a giant leap forward, achieving a tenfold increase in print speed while maintaining exquisite detail.

This breakthrough, presented in a new study, utilizes multiple focused beams instead of one, dramatically boosting voxel throughput. Imagine meticulously crafting millions of microscopic parts, like intricate medical devices or tiny, customized drug delivery drones, all within minutes. This is the future made possible by this innovative approach.

The researchers strategically arranged these laser beams using custom-made optical components, ensuring optimal focus and power delivery. Their high-precision system not only prints faster, but also handles a wider range of materials, opening doors for diverse applications.

The study (https://doi.org/10.37188/lam.2024.003) showcased its power through two impressive demonstrations. First, millions of custom-designed microparticles were printed, paving the way for personalized medicine and revolutionary drug delivery solutions. Second, the researchers unveiled a massive, complex metamaterial containing over 1.7 trillion voxels – a record-breaking feat in microprinting.

This advancement is not just about speed and complexity. It pushes the boundaries of affordability and accessibility. The critical optical components for this high-tech system were themselves printed using a commercially available laser printer, demonstrating the technology's potential for wider adoption and democratization.

This research paints a vibrant picture of the future. Imagine seamlessly printing intricate micromachines, personalized medical implants, and groundbreaking materials, all thanks to this multi-beam laser printing revolution. By pushing the limits of speed and precision, researchers are paving the way for a future where microprinting shapes the world – one tiny, meticulously crafted voxel at a time.

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