Developing 3D Bio-printer for Fabrication of Microfluidic Systems in Protein-Ligand Interaction

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Abstract

3D bioprinter engineered for the rapid and precise fabrication of microfluidic and millifluidic systems, and designed to enhance studies of protein-ligand interactions. This system integrates microfluidic-optimized nozzles with sub-micrometer precision, enabling swift biofabrication with biocompatible materials, significantly reducing the time and complexity associated with traditional lithographic or soft lithography techniques. The primary advantage of this bioprinter is its ability to quickly prototype fluidic channels and experimental setups, which facilitates real-time studies of biomolecular interactions in controlled, physiologically relevant conditions. Early experiments demonstrate that the printer can generate intricate fluidic environments faster but lower reproducibility compared to conventional methods. This rapid fabrication process not only accelerates experimental workflows but also enables high-throughput screening applications, such as drug discovery and protein engineering. By simulating protein-ligand binding dynamics more efficiently, this system offers superior versatility for studies in structural biophysics and biochemistry, making it an invaluable tool for advancing biomolecular research.

Key words: 3D bioprinter, rapid biofabrication, microfluidic systems, protein-ligand interaction, high-throughput screening.