

SLA-Based 3D Printing of Hydrogel Microfluidic Systems for Perfusion Bioreactors

Description

The advancement of tissue engineering and in vitro cell culture models increasingly relies on the development of physiologically relevant microenvironments. This master's thesis project focuses on the fabrication and characterization of hydrogel-based microfluidic systems using stereolithography (SLA) 3D printing. The primary objective is to establish a robust workflow for printing hydrogels with embedded microfluidic channels that can be integrated into a perfusion bioreactor for dynamic cell culture studies.

The project will begin with the optimization of SLA printing parameters tailored to hydrogel materials, aiming to achieve high-resolution and stable microstructures. It will further involve systematic characterization of the printed hydrogels, including mechanical properties (e.g., stiffness, elasticity), structural fidelity, and swelling behavior. Hydrogels will be evaluated for cytocompatibility, by assessing their suitability in supporting cell adhesion, viability, and proliferation. The developed constructs will subsequently be integrated into a perfusion bioreactor system to investigate fluid flow behavior and cellular responses under dynamic culture conditions that mimic physiologically relevant environments.

Through this work, the student will contribute to a broader, high-impact research effort with strong potential for scientific publication and co-authorship.

Requirements

- Good English skills, both written and spoken
- Ability to work independently in a structured and disciplined manner

Start: By arrangement
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