



Der Vorsitzende des Promotionsausschusses

EINLADUNG

Hiermit lade ich ein zum öffentlichen Promotionskolloquium von

Frau M.Sc. Zahra Kafrashian

Materialsynthese und Werkstoffentwicklung
(Prof. Dr. Aránzazu del Campo Bécares)

am

Donnerstag, 13. November 2025, 13:00 Uhr s.t.

per Videokonferenz: Link für MS Teams: <https://tinyurl.com/2x8axspj>

Raum für die Prüfung: Gebäude D2.5 – Leibniz-Saal

Thema der Dissertation:

Hydrogel-Based Side-Emitting Optical Waveguides for Light and Heat Delivery

Soft, side-emitting optical fibers offer new possibilities for controlled light delivery in biomedical contexts. However, achieving continuous fabrication with tunable optical properties remains challenging. This thesis presents hydrogel-based optical fibers produced via multimaterial extrusion printing, enabling precise modulation of side-emission along the fiber axis. Diacrylated Pluronic F-127 (PluDA) serves as the waveguiding material, while a PluDA-nanoparticle composite acts as the scattering medium. By alternating between these inks, fibers with submillimeter segment resolution are fabricated continuously, allowing programmable emission profiles. Additionally, plasmonic gold nanorods are incorporated to impart photothermal functionality, enabling localized heating under near-infrared illumination. Core-cladding architectures are optimized to achieve refractive index contrast and stable light guidance. The results demonstrate a scalable pathway to multifunctional, soft optical waveguides, expanding opportunities for biomedical applications such as targeted optical stimulation, sensing, and localized hyperthermia treatments.

Saarbrücken, 30. Oktober 2025



Prof. Dr.-Ing. Georg Frey