Integration of optical porous silicon biosensors with 3D printed microfluidics for biomarker detection

Initiative: SPRUNG (nur ausgewählte Ausschreibungen)

Ausschreibung: Forschungskooperation Niedersachsen - Israel

Bewilligung: 26.07.2020

Laufzeit:

Within the research project should aim to design a novel biosensor device for medical diagnosis that combines two attractive technologies: Biosensors based on porous silicon (PSi) and 3D-printed microfluidics. PSi is a sponge-like nanostructured material, which can be produced cost-effectively and allows efficient immobilization of biomolecules, such as aptamers, that act as specific receptors in biosensors. This biosensor setup enables the optical monitoring of various molecules, that bind directly and in real-time to selective aptamer sequences immobilized on the PSi. To extend its capabilities and performance, it will intend to integrate the PSi-based biosensor in a 3D-printed microfluidic device. Microfluidics reduce the dimensions of a system to the micrometer scale, thus reducing sample and reagent volume and analysis time. Importantly, systems miniaturization enables the design of portable devices by integrating several lab functionalities in one device that can be used directly by patients, thus avoiding the use of central laboratories. Microfluidic fabrication by 3D printing is a good alternative to traditional manufacturing, as it reduces costs and production time, and enables the fabrication of complex 3D structures in a one-step process.The proposed microfluidic biosensor will be designed to detect relevant disease biomarkers, i.e., molecules that indicate early signs of disease in extracted body fluids, such as blood. In approach, different microfluidic designs will be investigated to achieve the best performance and extend the platform capabilities, e.g., to facilitate the parallel detection of several biomarkers in one sample.

Projektbeteiligte

Dr. Janina Bahnemann
Universität Hannover
Naturwissenschaftliche Fakultät
Institut für Technische Chemie
Hannover

Dr.-Ing. Ester Segal
Technion-Israel Institute of Technology
Department of Biotechnology and Food Engineering
Haifa
Israel