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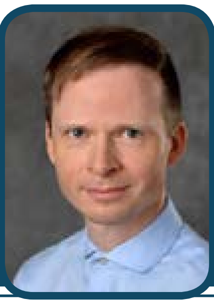

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Automation of biotechnological bioreactor production processes

The change of health care towards personalized medicine requires an adaptation of the biomedical and pharmaceutical production. The demand for sophisticated and customized products, including monoclonal antibodies, therapeutic proteins and vaccines, is ever growing. At the same time, high efficiency and product quality are key requirements. A personalized and affordable medicine requires low volume and highly parallelized production methods, frequently realized in single-use bioreactors. Complexity and requirements of strictly controlled bioreactor processes are increasing rapidly. A continuous measurement of relevant process parameters and full automation of biotechnological production processes are critical to a high process yield and productivity. Parallel real-time in-situ monitoring of a variety of parameters in complex fluids can be realized by suitable multi-sensor systems (Fig. 1). Integrated disposable in-situ monitoring and control systems are not commercially available, yet. Required systems should control typical parameters of a cell culture in a bioreactor process and monitor various metabolic proteins and lactate, the nutrient glucose and cell density as well as the pH and the temperature. Integrated bioMEMS with a functionalized bioactive recognition layer shall be used to detect in-situ and in real-time most specifically on the biomolecular level bioanalytes of interest in highly complex bioreactor environments. Key for a stable, reliable, and robust in-situ sensor- and actor-system with low bio-fouling property might be the use of highly biocompatible diamond and carbon material systems.

Biography

Tom Zimmermann was head of the business unit Biohybrid Systems at Fraunhofer and is with the Michigan State University since 2017. His research activities are in the field of diamond bioMEMS solutions in biomedical diagnostics, automation of biotechnological processes, and food analysis as well as in the development of diamond high-power terahertz systems. He graduated in solid-state electronics at the University Ulm (Germany), in 2002. He received the PhD degree in electrical engineering from the University Ulm (diamond and III-V devices) and joined the University of Notre Dame, in 2006. Where, he pursued research in high-power high-frequency devices, first as a post-doc and later on as research assistant professor. He has published his research in 30+ peer-reviewed journals and presented in 60+ conferences.

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