

# nanoSeminar Series 2022

Institute for Materials Science

**Dmitry Belyaev**

Institute for Material Science and Nanotechnology, TU Dresden

**Electrical and real-time label-free tracking of nano-bioreactors in multiphase microfluidics.**

Thursday, March 17<sup>th</sup> 2022  
13:00 – 14:00

Normal: Seminar Room 115, Hallwachsstr. 3 (HAL)

Pandemic version: <https://tinyurl.com/nanoSeminar-GA>

Droplet microfluidics has proved efficiency in simple manipulating of small volumes of liquid samples, especially in combination with electrochemical means of detection e.g. field-effect transistors, amperometric sensors, impedimetric sensors, etc. The abovementioned

combination has grown in a lab on a chip approach for the detection of various substances. However, the problem of precise droplet manipulation and long-term recirculation over individual sensors is still present. Present work is focused on microfluidic design and the way of liquid control that enables recirculation real-time monitoring of about a hundred droplets with microwire-based impedimetric sensors. The long-term recirculation of droplets over the microwire area can be used for monitoring biochemical reactions whose real-time analysis of the kinetics can be advantageous for a more precise analysis. The combination of circular microfluidics and nanosensors allows long-term recirculation of droplets over the sensor which can be used for monitoring biochemical reactions within solutions or cell/bacteria cultures. The generation of around a hundred droplet reactors provides high reliability and throughput of the result due to statistical reasons, precise flow-rate manipulation allows viability of the assay, and impedimetric way of monitoring provides an immersive analysis of the embedded compounds.

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Dmitry completed his bachelor degree in Moscow Institute of Physics and Technology (MIPT) with the specialization on Applied Mathematics and Physics. In 2017 he joined our chair and obtained his MSc degree at TU Dresden. During the master thesis he investigated the area of synergy between droplet microfluidics and nanosensorics for label-free bioassays.

In 2017 continued his work as PhD student under Prof. Gianauelio Cuniberti and worked on development of the technique allowing in-time investigation and detection of chemical and biological substances in droplets using microfluidics and nanosensorics.