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Microfluidics platform for nanoparticles synthesis

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The increasing demand for nanoparticles with well-defined uniform properties applied in various technical fields is nowadays limited by available fabrication techniques. The presented work is based on the microfluidic system, which greatly increases the effectiveness of nanoparticles production and characterization, decreases the unwanted by-products, as well as saves time compared to standard wet chemical batch procedures. Nanoparticles prepared using microfluidics platforms are designed for the biomedical application. Among the most important parameters of nanoparticles belong their hydrodynamic diameter, particle size distribution, surface properties and morphology. The main aim of this work is to use microfluidics in the synthesis of nanoparticles with high control over the reaction and process parameters compared to standard wet chemical batch procedures. A single droplet of dispersed phase formed inside the microfluidic chip represents a reaction vessel for nanoparticle synthesis where all reactants are effectively mixed. The surface of the nanoparticles is modified with a specific antibody IgG-M75 and an adhesion to a specific target, a trans-membrane protein over-expressed in a wide variety of tumor cells, carbonic anhydrase IX is tested inside a perfusion system. In this work, we employed CFD simulation of two-phase flow in order to design a microfluidic chip and study governing physical parameters and their influence on droplet formation process and mixing efficiency. Results of nanoparticle synthesis in the microfluidic system and their surface modification will be presented and discussed.

Biography

Viola Tokarova completed her PhD in 2014 at the Department of Chemical Engineering at UCT Prague. She spent two years as a PostDoc at the Biological Microfluidics Laboratory at McGill University. In 2017, she established the Biomimetic Engineering Laboratory at UCT Prague (http://biomimetic-lab.vscht.cz/). The laboratory is focused on preparation and testing of variously structured nano- and micro-objects and surfaces inspired by nature.

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