# Microfluidic approach to nanoparticle synthesis

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## ABSTRACT

Nanoparticles for biomedical applications need to meet several requirements. Among the most critical ones belong their size and morphology; the surface is modified with specific markers to target specific tissue; and they have a specific function, e.g. drug delivery, sensor, detection or heat ability in hyperthermia treatment Microfluidic synthesis is promising many advantages over standard batch synthesis. Firstly, a large surface area to volume ratio of microchannels helps to increase mass and heat transfer in the system. It provides higher efficiency using smaller reaction volumes than batch methods. Secondly, microchips are more suitable to work at harsh conditions in comparison to the batch reactors with regards to rapid temperature and pressure changes while using toxic and explosive materials. The presented work describes a microfluidic approach to nanoparticles synthesis, namely silver and magnetite nanoparticles. Nanoparticles are synthesized in a droplet-based microfluidic chip with high control over the reaction and process parameters. We employed CFD simulation of two-phase flow in order to design a microfluidic chip and study governing physical parameters and their influence on the droplet formation process and mixing efficiency.

**Keywords:** droplet-based microfluidics; magnetite; mixing, nanoparticle synthesis; silver