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Microfluidic systems for pharma technology - The manipulation of cells, droplets and particles

In a world that becomes increasingly concerned about affordable health care, fast and effective screening methods for drugs in different formulations are required in the course of their development. In addition, the trend towards personalized medicine demands production of drugs in very small volumes. For both, the microfluidic approach is ideally suited. With miniaturized systems that can be realized by micro- or nanofabrication processes, new tools for pharmaceutical research and development become available. As new and better technologies for pre-clinical screening of drugs and formulations microfluidic cell culture models that can mimic *in-vivo* conditions have attracted much attention. Recently developed organ-on-chip platforms providing dynamic flow conditions like cornea-on-chip and pancreas-on-chip will be presented including aspects of their microfluidic design, their fabrication and application. These systems are equipped with integrated sensors but also allow microscopic access at low background auto fluorescence. Furthermore recent work on the production of nanoparticle formulations within microfluidic droplet flows and plug flows will be discussed. In thereby obtained smallest fluid volumes mixing is accelerated and very controlled precipitation occurs. This leads to nanoparticle formulations in which particle sizes can be tuned by external flow controls. These approaches offer new possibilities for production at smallest scales and for improving the bioavailability of poorly soluble drugs.

Biography

Andreas Dietzel studied Physics and completed his PhD at University of Göttingen in 1990. In the years 1990 to 2003, he worked in different organizations of IBM including the Research Laboratory in Rüschlikon. In 2004, he joined TU Eindhoven as a Full Professor of Micro and Nanoscale Engineering. In 2012, he was appointed as Professor at TU Braunschweig and Director of the Institute of Micro-technology. His research interest focuses on "The design and fabrication of microsystems and especially of microfluidic systems with applications in the life sciences".

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