Digital reaction technology by micro segmented flow—components, concepts and applications

Köhler JM, Henkel T, Grodrian A, Kirner T, Roth M, Martin K, Metze J (2004) Digital reaction technology by micro segmented flow—components, concepts and applications *Chemical Engineering Journal* 101, 201-216.

Details

Abstract

Segmented fluids can easily be processed in micro reactors and micro capillaries, if several boundary conditions are fulfilled. The ability of formation of highly regular segments and segment distances in combination with the ability of controlled manipulation, splitting and fusion of carrier liquid columns and single droplets opens the way to a new class of miniaturized chemical and biological operations. The subdivision of a certain reaction or a cultivation volume in a lot of aliquotes and the individual handling of the subvolumes leads to the possibility of realizing serial processes and statistical investigations by numerous highly comparable, but well separated reactor volumes. Combination of different substances, e.g. for testing of synergetic effects in drug development or catalysts screening, can be performed to large extent. The concept of “digital” reaction technology by micro fluid segments means the introduction of a digitalization principle by use of a large number of small reaction volumes handled serially in flow channels and flow-through micro devices. For the realization a set of modules including special interconnectors, T-junctions and other injector elements, transfer units and fluid resistance elements are necessary. Flow fusion modules and segment fusion modules are needed for the reorganization and recombination of serially flowing sequences of fluid segments and for the initiation of reactions by mixing of pairs

and triplets of single segments. The principle can be used for quantitative chemical analyses like titration realized by use of micro fluid segments (digital micro segment titration). Micro segments could also be applied in modular synthetic chemistry, particularly in combinatorial chemistry so far as the educts and products of the single synthesis steps are compatible with liquid/liquid two phase system. The segmented flow principle is of particular interest in microbiological experiments and screening procedures. First result show the practical advantages in the highly parallelized production of monoclonal cell cultures in culture sets of very high diversity and for the cultivation of slowly growing microbial species. In addition, the possibility of producing of separated cell cultures in high density opens a series of applications in the screening and testing of drugs.

Beteiligte Forschungseinheiten

Biotechnikum Miriam Agler-Rosenbaum Mehr erfahren

Leibniz-HKI-Autor*innen



Karin Martin

Details



Martin Roth

Details

Themenfelder

Tropfenbasierte Mikrofluidik

Identifier

doi: https://doi.org/10.1016/j.cej.2003.11.025