

Segment-fusion chip calorimetry – a new method for the investigation of fast reactions

Johannes Lerchner and Florian Mertens

Technische Universität Bergakademie Freiberg, Institute of Physical Chemistry,
Leipziger Straße 29, 09599 Freiberg, Germany

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The small thermal time constants of chip calorimeters provide favorable conditions for the examination of reactions with fast kinetics. However, if the advantages of flow-through calorimetry such as high sample throughput and defined reaction conditions are to be exploited, the investigation of fast reactions is limited by slow, diffusion determined mixing of the reactants and sample dispersion. To overcome these constraints, a segment-fusion technique was implemented into a segmented-flow chip calorimeter [1]. With this technique, separate segments of few microliters containing different reactants are sequentially transported to the measuring chamber by a carrier liquid and merged therein at a defined position. In contrast to parallel access of reactants to the measuring chamber which corresponds to the conventional operation principle of flow-through reaction calorimeters (e. g. [2]), the design of the calorimeter can be much simpler mainly because the implementation of integrated micro-mixers is avoided. The measuring process can be fully automated. Therefore, the method has great potential for screening applications.

So far, the method has been successfully applied for the rapid detection of ligand-acceptor interactions, the analysis of enzyme kinetics, the determination of the response of living cells to substrate pulses, and the investigation of the control dynamics of the Ca^{2+} metabolism of parasites.

References:

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