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Liquid mixing in T-shaped and zigzag-shaped microreactors[1] M. HOFFMANN, M. SCHLUETER, N. RAEBIGER, University of Bremen — Microreactors are basic components of microfluidic systems for chemical applications and the large area-to-volume ratio allows for a higher yield and selectivity than conventionally designed processes. To take advantage of the full potential of this technology, a fundamental understanding of the transport processes on the relevant time and length scales is necessary. One approach is the use of non-invasive measurement techniques, i.e. micron resolution particle image velocimetry (micro-PIV) and micron resolution laser induced fluorescence (micro-LIF) in order to measure the velocity and concentration fields (mixing of a passive tracer as well as reactive mixing). By using a confocal laser scanning microscope it is possible to remove out-of-focus emitted light and thus improve the lateral and axial spatial resolution. Hence a three-dimensional concentration field inside the mixing channel (T- and zigzag-shaped micromixers) can be rendered and a determination of the tracer distribution at different cross sections is basis for a quantitative analysis. The experimental analysis of the velocity fields (2 dimensions + 2 components) are basis for the calculation of the out-of-plane velocity component by using the continuity equation. With the knowledge of all three velocity components the 3D streamlines can be visualized and a calculation of the local rate of energy dissipation is possible.

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