**CHEMICAL AND OPTICAL MIXING CHARACTERIZATION OF A DYNAMIC INLINE MIXER**

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Mixing of viscous fluids can have a major impact on the safety of a process, process costs, energy efficiency and, moreover, on the yield and quality of the end product. The challenge in continuous mixing of viscous fluids lies mainly in the conveying technology, temperature control and reaction conversion tracking. Powered by technological advances backed by enhanced modeling capabilities, the exploration of molecular–scale mixing (micromixing) in highly–viscous solutions is witnessing a renaissance in the chemical industry.
As a real step forward, mixing efficiency measurements in a viscosity range up to 15 Pas will be presented using the Villermaux–Dushman (VD) reaction. The VD reaction serves as a chemical test reaction for the investigation of micromixing quality. Insight is given into the global mixing behavior of a continuous rotor–stator mixer, which is already used in industry, e. g. for coloring polymer melts.

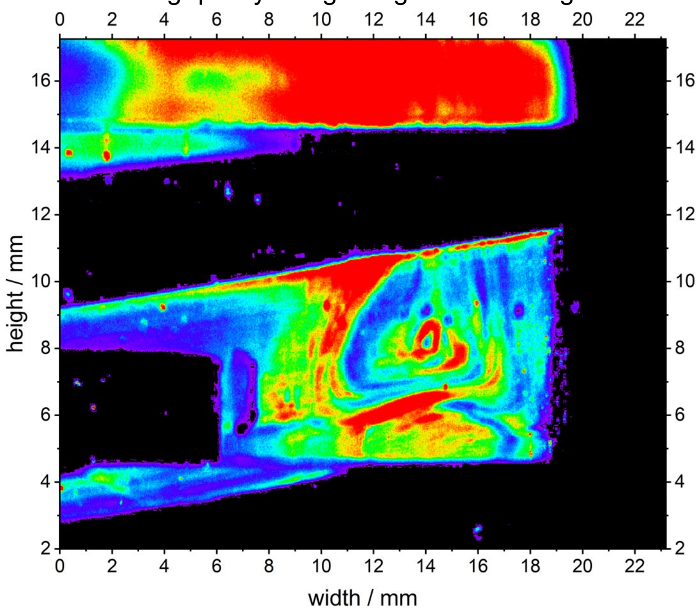


*Figure 1 – PLIF experiment, visualization of a vortex.*

To gain deeper insight into local mixing behavior, 3D printing of transparent mixers has been significantly further developed and a standard operating procedure is now available. The planar laser–induced fluorescence (PLIF) technology was used as optical sensor. Local vortices as well as concentration gradients were multidimensional resolved in the 3D printed transparent mixers. Through PLIF and micromixing experiments, the optimal location of the second component's addition was determined. Dimensionless equations were derived which allow to describe the influence of rotor speed and volumetric flow on the mixing results.

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