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Experimental and numerical analysis of the reaction yield in a T-microreactor ALESSANDRO MARIOTTI, CHIARA GALLETTI, ELISABETTA BRUNAZZI, ROBERTO MAURI, MARIA VITTORIA SALVETTI, DICI - University of Pisa — Microfluidic devices are attracting considerable interest in pharmaceutical and fine chemistry industry, because they allow continuous reactions with an unprecedented control over operating conditions. One critical issue in the use of microreactors is to obtain an efficient mixing and a high reaction yield while the flow being laminar, due to the small dimensions. In this context, the simplest and most studied configuration is the T-shaped one. The flow regimes occurring in these devices as the Reynolds number varies and the related mixing are well characterized in the literature. On the other hand, there is a little understanding of the effect of flow regimes on the yield of a chemical reaction. The present work is aimed at analyzing this aspect through the synergic use of experiments and numerical simulations. PIV measurements are used to characterize the flow pattern and optical techniques are employed to measure the reaction yield because the test-reaction is accompanied by discoloration. Simulations are based on finite-volume technique and local grid-adaptation. The chosen test-reaction is catalyzed by an acid in a homogeneous phase and this allow to easily investigate the combined effect of the Damkhler and of the Reynolds numbers on the reaction yield.

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