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Validation of CFD models for microscale nanoprecipitation reactor using μ-PIV and confocal μ-LIF YANXIANG SHI, Dept. of Chemical and Biological Engr., Iowa State Univ., MICHAEL G. OLSEN, Dept. of Mechanical Engr., Iowa State Univ., RODNEY O. FOX, Dept. of Chemical and Biological Engr., Iowa State Univ. — Over the past a few decades, computational fluid dynamics (CFD) models have become more and more important in the process of reactor design in chemical engineering. Compared to experimental methods, they can provide comprehensive information on the flow field as well as other fields, such as concentration. However, they also need to be validated against experimental data to ensure the accuracy. In this work, the micro-scale particle image velocimetry (μ-PIV) is employed in conjunction with the confocal-base micro-scale laser induced fluorescence (μ-LIF) to specifically validate CFD models for use in microscale nanoprecipitation reactor. The former is for the velocity field measurement and the latter gives us the mixture fraction information. Both RANS and LES are used to simulate the field flow. For RANS, a DQMOM-IEM micromixing model is used to predict the mixture fraction field while only a scalar transport equation is solved in the LES simulations. Comparisons between simulation results and experimental data show that RANS might not be the right tool for such reactors. LES, on the other hand, gives reasonably satisfactory predictions.

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