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Turbulent velocity and concentration measurements in a macroscale multi-inlet vortex nanoprecipitation reactor ZHENPING LIU, RODNEY FOX, JAMES HILL, MICHAEL OLSEN, Iowa State University — Flash Nanoprecipitation (FNP) is a technique to produce monodisperse functional nanoparticles. Microscale multi-inlet vortex reactors (MIVR) have been effectively applied to FNP due to their ability to provide rapid mixing and flexibility of inlet flow conditions. A scaled-up MIVR could potentially generate large quantities of functional nanoparticles, giving FNP wider applicability in industry. In the presented research, the turbulent velocity field inside a scaled-up, macroscale MIVR is measured by particle image velocimetry (PIV). Within the reactor, velocity is measured using both two-dimensional and stereoscopic PIV at two Reynolds numbers (3500 and 8750) based on the flow at each inlet. Data have been collected at numerous locations in the inlet channels, the reaction chamber, and the reactor outlet. Mean velocity and Reynolds stresses have been obtained based on 5000 instantaneous velocity realizations at each measurement location. The turbulent mixing process has also been investigated with passive scalar planar laser-induced fluorescence and simultaneous PIV/PLIF. Velocity and concentration results are compared to results from previous experiments in a microscale MIVR. Scaled profiles of turbulent quantities are similar to those previously found in the microscale MIVR.

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