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Turbulent velocity and concentration measurements in a multi-inlet vortex nanoprecipitation reactor MICHAEL G. OLSEN, ZHENPING LIU, EMMANUEL HITIMANA, Iowa State University, Mechanical Engineering, JAMES C. HILL, RODNEY O. FOX, Iowa State University, Chemical and Biological Engineering — Turbulent flow characteristics in a multi-inlet vortex reactor (MIVR) are of interest due to this reactor's importance in nanoprecipitation applications. In the presented work, velocity and passive scalar concentration fields in a macroscale MIVR have been investigated by using stereoscopic particle image velocimetry (SPIV) and planar laser induced fluorescence (PLIF). The measurements are focused near the reactor center where the turbulent mixing occurs. The investigated Reynolds numbers based on the bulk velocity and diameter at the reactor outlet range from 16800 to 42000, resulting in a complex turbulent swirling flow within the reactor. The mean velocity field can be divided into free vortex region and forced vortex region from the wall to the reactor center. Back flow appears due to the low pressure in the forced vortex region. Most of turbulent fluctuation and mixing also occur in the forced vortex region while two point spatial correlations show turbulent eddies undergo shear stretching in the free vortex region. The flow is found to be unsteady with a wandering vortex center. As expected, a mixing performance is found to improve with increasing Reynolds number.

Zhenping Liu
Iowa State University, Mechanical Engineering

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