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Experimental investigation of disparate viscosity turbulent mixing in a coaxial jet mixer[1] MICHAEL AHMAD, GOKUL PATHIKONDA, MUSTAFA USTA, Georgia Institute of Technology, IRFAN KHAN, Dow Company, CYRUS AIDUN, DEVESH RANJAN, Georgia Institute of Technology — Industrial chemical processes often involve continuous mixing of streams of reactants at different viscosities. In contrast to streams of constant viscosity, the variable viscosity streams provoke different mechanisms for turbulence and mixing, which are known to affect chemical yield. These mechanisms need thorough study to enable predictive modeling of such phenomena. Thus, simultaneous PIV and PLIF are employed to measure the turbulent and mixing dynamics in a confined, co-annular jet flow with viscosity ratios up to 40. This data reveal the effects of the imposed viscosity gradients on the nature in which the jet spreads into the co-flow. Evidently, the viscosity disparity largely confines the vortical structures to the lower viscosity fluid resulting in larger and more intermittent scalar structures in the higher viscosity fluid. This overarching phenomena reflects itself within realizations of the mean velocity and scalar fields, but also the Reynold stresses and turbulent and scalar dissipation. These observations allude to differences in expected chemical yield. This study is performed concurrently with a computational effort to develop insight for SGS models of turbulent mixing within mediums with viscosity gradients.

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