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Investigating the structure of turbulence in disparate viscosity mixing in a co-axial jet mixer[1] GOKUL PATHIKONDA, MICHAEL CAMERON AHMAD, MUSTAFA USTA, Georgia Institute of Technology, IRFAN KHAN, Dow Chemical Company, CYRUS AIDUN, DEVESH RANJAN, Georgia Institute of Technology — When active turbulent mixing is coupled with mixing-limited complex reactions (for eg., consecutive-competitive reactions), changes in turbulent structure significantly affects the reaction products and yield. The turbulent mixing between two liquids of disparate viscosities is investigated experimentally using a simultaneous PIV and PLIF diagnostics in a co-flowing jet configuration for different viscosity ratios (m). The simultaneous measurements of velocity and mixture-fraction (and thus the viscosity) fields enable studying the coupled mixing dynamics between the velocity and scalar fluctuations. A skewed distribution of turbulent kinetic energy towards the low viscosity fluid is identified, which can significantly affect the effective local reaction stoichiometry of a hypothetical reaction. Conditional estimates of turbulent kinetic energy and scalar dissipation with respect to local viscosity are studied for similar trends and the effect of viscosity ratio on the same. Finally, the local stress-strain eigenvector alignments are studied to identify changes in local turbulent structure with increasing viscosity disparity.

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