

Abstract Submitted
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Competitive-consecutive reaction of liquids with disparate viscosity¹ MUSTAFA USTA, GOKUL PATHIKONDA, MICHAEL AHMAD, Georgia Institute of Technology, IRFAN KHAN, Dow Company, DEVESH RANJAN, CYRUS AIDUN, Georgia Institute of Technology — Competitive-consecutive reactions between liquids with disparate viscosity come along with several challenges due to high Schmidt (Sc) number and high reaction rates. The relevant scales at high Sc for a scalar become much smaller than turbulent dissipative scales. Higher reaction rates turn the problem into mixing limited reactions. In this study, we employ large-eddy simulation (LES) to investigate the effect of viscosity ratio on the reaction yields. The focus is on the co-axial jet and jet in crossflow mixing. In addition to the computations, the experimental setup features PIV and PLIF measurements to resolve the velocity and the mixture fraction. The investigations reveal that the mixing and reaction characteristics are considerably affected by the viscosity ratios of the liquids. The results for the mixing will be presented with comparison to experiments for the viscosity ratio of up to 40. The chemical reaction results; and the challenges in the subgrid scale modeling of variable viscosity, high Schmidt number, and high reaction rates will be presented for various viscosity ratios.

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