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Characterization of Mixing and Ignition Effects in Flow-Reactors Using a Particle Method SIMON WEIHER, ETH Zurich, MATTHIAS IHME, University of Michigan — Recent investigations have indicated discrepancies between measurements and simulations of the ignition delay for syngas-mixtures at high-pressure/low- temperature conditions. While relevant sources for these discrepancies have been identified in the context of rapid compression machines and shock tubes, the underlying mechanisms and nonidealities in flow-reactor experiments have not yet been quantified. The objective of this investigation is to characterize effects of turbulence and flow-field inhomogeneities on the mixing and ignition-dynamics in flow-reactors. To this, an idealized flow-reactor is considered, in which the unsteady and three-dimensional flow-field is obtained from the solution of a large-eddy simulation. A particle method is used to describe the mixing, induction, and subsequent ignition of the reactants. Utilizing this model, parametric studies are performed to systematically quantify effects of initial mixture-preparation, flow-rate modulation, and turbulence-levels on the ignition-process over a range of practically relevant temperature and pressure conditions.

Simon Weiher
ETH Zurich

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