

Kinetics of Combustion of Synthetic Jet Fuels

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Research on the production and combustion of synthetic jet fuels is of increasing importance because of their potential for addressing security of supply and sustainable air transportation challenges. The combustion of several synthetic fuels (gas-to-liquid, coal-to-liquid, naphthenic cuts with typical chemical composition of products coming from biomass or coal liquefaction) and blends were studied in a jet-stirred reactor under the same conditions (temperature, 550-1200 K; pressure, 10 bar; equivalence ratio, 0.5-2; initial fuel concentration, 1000 ppm). Surrogate model-fuels were designed based on fuel composition and physico-chemical properties for simulating the oxidation kinetics of these fuels. We used surrogates model-fuels consisting of mixtures of n-decane, decalin, tetralin, 2-methylheptane, 3-methylheptane, n-propylcyclohexane, and n-propylbenzene. The detailed chemical kinetic reaction mechanism proposed was validated using the entire experimental database obtained in JSR. Kinetic computations involving reaction paths analyses and sensitivity analyses were used to interpret the results.