High pressure $n$-decane and $n$-dodecane shock tube experiments were conducted to assist in the development of a Jet-A surrogate kinetic model. Jet A is a kerosene based jet fuel composed of hundreds of hydrocarbons consisting of paraffins, olefins, aromatics and naphthenes. In the formulation of the surrogate mixture, $n$-decane or $n$-dodecane represent the normal paraffin class of hydrocarbons present in aviation fuels like Jet A. The experimental work on both $n$-alkanes was performed in a heated high pressure single pulse shock tube. The mole fractions of the stable species were determined using gas chromatography and mass spectroscopy. Experimental data on both $n$-decane and $n$-dodecane oxidation and pyrolysis were obtained for temperatures from 867–1739 K, pressures from 19–74 atm, reaction times from 1.15–3.47 ms, and equivalence ratios from 0.46 to 2.05, and ∞. Both $n$-decane and $n$-dodecane oxidation showed that the fuel decays through thermally driven oxygen free decomposition at the conditions studied. This observation prompted an experimental and modeling study of $n$-decane and $n$-dodecane pyrolysis using a recently submitted revised $n$-decane/iso-octane/toluene surrogate model. The surrogate model was extended to $n$-dodecane in order to facilitate the study of the species and the 1-olefin species quantified during the pyrolysis of $n$-dodecane and $n$-decane were revised with additional reactions and reaction rate constants modified with rate constants taken from literature. When compared against a recently published generalized $n$-alkane model and the original and revised surrogate models, the revised (based on our experimental work) and extended surrogate model showed improvements in predicting 1-olefin species profiles from pyrolytic and oxidative $n$-decane and $n$-dodecane experiments. The revised and extended model when compared to the published generalized $n$-alkane and surrogate models also showed improvements in predicting species profiles from flow reactor $n$-decane oxidation experiments, but similarly predicted $n$-decane and $n$-dodecane ignition delay times.

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