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Numerical investigation of spray ignition of a multi-component fuel surrogate LARA BACKER, KRITHIKA NARAYANASWAMY, PERRINE PEPIOT, Cornell University — Simulating turbulent spray ignition, an important process in engine combustion, is challenging, since it combines the complexity of multi-scale, multiphase turbulent flow modeling with the need for an accurate description of chemical kinetics. In this work, we use direct numerical simulation to investigate the role of the evaporation model on the ignition characteristics of a multi-component fuel surrogate, injected as droplets in a turbulent environment. The fuel is represented as a mixture of several components, each one being representative of a different chemical class. A reduced kinetic scheme for the mixture is extracted from a well-validated detailed chemical mechanism, and integrated into the multiphase turbulent reactive flow solver NGA. Comparisons are made between a single-component evaporation model, in which the evaporating gas has the same composition as the liquid droplet, and a multi-component model, where component segregation does occur. In particular, the corresponding production of radical species, which are characteristic of the ignition of individual fuel components, is thoroughly analyzed.

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