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Implementation of Thermal Diffusion in Chemistry Tabulation for Unstable Premixed Flames JASON SCHLUP, GUILLAUME BLANQUART, Caltech — The inclusion of thermal diffusion, by means of multicomponent diffusion transport models, has been shown to affect the results of numerical simulations of thermo-diffusively unstable lean hydrogen flames. However, the multicomponent diffusion model involves costly matrix inversion operations, leading it to be useful in only simplified flame configurations and computational domains. In this work, a mixture-averaged thermal diffusion model is implemented into a tabulated chemistry framework. The resulting reacting flows are compared to one- and two-dimensional detailed chemistry simulations of lean hydrogen-air flames with multicomponent diffusion. The configurations used to validate the mixture-averaged thermal diffusion model with tabulated chemistry include flat and cellular tubular flames. Three-dimensional flames, both laminar and turbulent, are also considered as an application of the mixture-averaged thermal diffusion model using tabulated chemistry. These flames are compared to cases neglecting thermal diffusion and cases using detailed chemistry with the mixture-averaged thermal diffusion model.

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