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On the Consistent Flamelet Model Formulation for Transcritical Fluid Flow and Combustion ZHENG QIAO, YU LV, Department of Aerospace Engineering,Mississippi State University — Fluid flows in transcritical thermodynamics conditions have numerous applications in combustion engines and thermal energy devices. Under such conditions, the fluid behaviors are largely affected by the peculiar viscous transport properties and nonlinear thermodynamic relations. To achieve cost-effective modeling of transcritical fluids, the flametlet model has been exploited and investigated by a number of studies. This study focuses on the effects of model formulations on the flamelet predictions of transcritical fluids in both pure-mixing and combustion conditions. We first derive the consistent flamelet formulation based on Pitsch & Peters (1998) and then examine the constant Lewis assumption and the interspecies enthalpy flux on the flamelet predictions. For illustration purpose, the H2/air system at various thermal conditions is considered. Our study concluded that it is of importance to consider the detailed consistent model formulation in flamelet modeling of transcritical fluids.

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