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Validity of a LES/flamelet approach to a transcritical O2/H2 jet flame REO KAI, KENICHIRO TAKENAKA, AKIHIRO KISHIMOTO, RYOICHI KUROSE, Kyoto Univ — A large-eddy simulation (LES) employing a flamelet/progress-variable approach is applied to a transcritical oxygen (O2)/hydrogen (H2) jet flame, and the combustion mechanism is investigated. The LES is performed using an in-house thermal flow analysis code FK3. The flamelet library is created using the one-dimensional analysis version of FK3, i.e. FK3/1d, employing a chemical reaction mechanism of 8 species and 21 reactions at the pressure of 10 MPa. For both the calculations of LES and flamelet library, the SRK equation of state and the TRAPP method are used to take the real gas effects into account. The results show that in the present transcritical combustion, oxygen and hydrogen, which are issued into the chamber in the liquid and supercritical states, respectively, react in the gas state. Here, the oxygen experiences the supercritical state before reaching the gas state. It is also observed that the present LES can well capture the liquid oxygen core breakup.

Reo Kai
Kyoto Univ

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