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3D DNS of Turbulent Premixed Flame with over 50 Species and 300 Elementary Reactions MASAYASU SHIMURA, BASMIL YENERDAG, YOSHITSUGU NAKA, Tokyo Institute of Technology, YUZURU NADA, The University of Tokushima, MAMORU TANAHASHI, Tokyo Institute of Technology —
Three-dimensional direct numerical simulation of methane-air premixed planar flame propagating in homogenous isotropic turbulence is conducted to investigate local flame structure in thin reaction zones. Detailed kinetic mechanism, GRI-Mech 3.0 which includes 53 species and 325 elementary reactions, is used to represent methane-air reaction, and temperature dependences of transport and thermal properties are considered. For a better understanding of the local flame structure in thin reaction zones regime, distributions of mass fractions of major species, heat release rate, temperature and turbulent structures are investigated. Characteristic flame structures, such as radical fingering and multi-layered-like flame structures, are observed. The most expected maximum heat release rate in flame elements is lower than that of laminar flame with same mixture. To clarify mechanism of the decrease in local heat release rate, effects of strain rates tangential to flame front on local heat release rate are investigated.

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