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Effects of Lewis number on turbulent kinetic energy transport at high Karlovitz numbers. HSU CHEW LEE, PENG DAI, Southern University of Science and Technology, ZHENG CHEN, Peking University, MINPING WAN, Southern University of Science and Technology — Three-dimensional Direct numerical simulation (DNS) with detailed chemical kinetics scheme was used to investigate the statistical behavior of turbulent kinetic energy (TKE) transport in dodecane (Lewis = 4.2) and hydrogen (Lewis = 0.4) flames at Karlovitz numbers ranging from 4 to 150 spanning thin and broken reaction zones. The behavior of the terms in the TKE transport equation is analyzed and scaling terms proposed for the thin reaction zone is examined for a broken reaction zone and high Lewis number. The resulting normalized TKE transport equation involves only a small set of parameters. The Lewis number is found to affect only the mean velocity dilatation term and the velocity-pressure gradient term, while other terms in the TKE balance behaved identically to fuels with unity Lewis number. The TKE transport due to velocity fluctuations term is found to be insignificant when compared to other terms in the TKE transport equation regardless of the Lewis and Karlovitz numbers.

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