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Investigating the effects of critical phenomena in premixed methane-oxygen flames at cryogenic conditions ABISHEK GOPAL, Univ of Maryland-College Park, SHASHANK YELLAPANTULA, National Renewable Energy Laboratory, JOHAN LARSSON, Univ of Maryland-College Park — Methane is increasingly becoming viable as a rocket fuel in the latest generation of launch vehicles. In liquid rocket engines, fuel and oxidizer are injected under cryogenic conditions into the combustion chamber. At high pressures, typical of rocket combustion chambers, the propellants exist in supercritical states where the ideal gas thermodynamics are no longer valid. We investigate the effects of real-gas thermodynamics on transcritical laminar premixed methane-oxygen flames. The effect of the real-gas cubic equations of state and high-pressure transport properties on flame dynamics is presented. We also study real-gas effects on the extinction limits of the methane-oxygen flame.

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