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Turbulent Flame Speed Scaling for Positive Markstein Number Expanding Flames in Near Isotropic Turbulence[1] SWETAPROVO CHAUDHURI, FUJIA WU, CHUNG LAW, Princeton University — In this work we clarify the role of Markstein diffusivity on turbulent flame speed and it's scaling, from analysis and experimental measurements on constant-pressure expanding flames propagating in near isotropic turbulence. For all C0-C4 hydrocarbon-air mixtures presented in this work and recently published C8 data from Leeds, the normalized turbulent flame speed data of individual mixtures approximately follows the recent theoretical and experimental $Re_{T,f}^{0.5}$ scaling, where the average radius is the length scale and thermal diffusivity is the transport property. We observe that for a constant $Re_{T,f}^{0.5}$, the normalized turbulent flame speed decreases with increasing Mk. This could be explained by considering Markstein diffusivity as the large wavenumber, flame surface fluctuation dissipation mechanism. As originally suggested by the theory, replacing thermal diffusivity with Markstein diffusivity in the turbulence Reynolds number definition above, the present and Leeds dataset could be scaled by the new $Re_{T,f}^{0.5}$ irrespective of the fuel considered, equivalence ratio, pressure and turbulence intensity for positive Mk flames.

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