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Spectral Analysis of Turbulent Diffusion Effects in Premixed Ammonia/Hydrogen/Nitrogen-Air Flames[1] MYOUNGKYU LEE, MARTIN RIETH, HEMANTH KOLLA, JACQUELINE CHEN, Sandia National Laboratories — Multi-scale spectral analysis of the contributions of turbulent diffusion relative to molecular diffusion is presented with recent DNS of turbulent premixed ammonia/hydrogen/nitrogen-air premixed flames in intense sheared turbulence. Damköhler's second hypothesis states that the turbulent flame speed is proportional to the square root of the sum of molecular and turbulent diffusivities, and where to leading order, the turbulent diffusivity scales as the product of the relevant velocity fluctuation and turbulence length scale. The spectral analysis enables clarification of the influence of different eddy scales that are most effective at turbulent mixing through the diffusion of heat and mass, including the effects of mean shear. The relative importance of differential diffusion of hydrogen and turbulent diffusion of heat and mass internal to the flame and their scale dependency is also determined. For this study, the spectral densities are defined as Fourier transformations of density-weighted two-point correlations suggested by Kolla et al (*J. Fluid Mech.*, 2014, **vol 754**, 456-487). The preliminary results show that the dominant eddy scale for turbulent diffusion and return-to-isotropy rate vary among different species.

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