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DNS of autoigniting turbulent jet flame RAJAPANDIYAN ASAITHAMBI, KRISHNAN MAHESH, University of Minnesota — Direct numerical simulation of a round turbulent hydrogen jet injected into vitiated coflowing air is performed at a jet Reynolds number of 10,000 and the results are discussed. A predictor-corrector density based method for DNS/LES of compressible chemically reacting flows is developed and used on a cylindrical grid. A novel strategy to remove the center-line stiffness is developed. A fully developed turbulent pipe flow simulation is prescribed as the velocity inlet for the fuel jet. The flame base is observed to be stabilized primarily by autoignition. Further downstream the flame exhibits a diffusion flame structure with regions of rich and lean premixed regimes flanking the central diffusion flame. The lift-off height is well predicted by a simple relation between the ignition delay of the most-reactive mixture fraction and the streamwise velocity of the jet and coflow.

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