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Numerical Study of Multi-Component Mixing in Shock-Accelerated Flows Using Localized Artificial Diffusivity Method[1] SANTHOSH SHANKAR, SOSHI KAWAI, SANJIVA LELE, Stanford University —
There has been a long-standing interest in developing numerical algorithms for compressible multi-component flows. The performance of the localized artificial diffusivity method of Kawai et al. (JCP 2009) on such problems is demonstrated by comparing the results for simple test cases with exact solutions and previous numerical calculations. The scheme is then used to simulate a 2D shock-bubble interaction by solving the full compressible Navier-Stokes equations to study the underlying mechanisms of mixing in this flow. The initial concentration of the dense gas bubble is modeled and the initial flow conditions are matched to the experiments of Tomkins et al. (JFM 2008) where a Mach 1.2 shock in air interacts with a cylindrical column in SF6. The grid converged results of the mixing rate and profile are quantitatively compared with the experiments for validation. In addition 3D simulations of Richtmyer-Meshkov instability based on the experiments of Vetter and Sturtevant (Shock Waves 1995) will be presented with particular focus on the turbulent missing in terms of the mixing width, the mixing rate and turbulent spectra.

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Santhosh Shankar
Stanford University

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