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Numerical Simulations of the Single-mode, Reacting Richtmyer-Meshkov Instability Using Detailed Chemistry NITESH ATTAL, PRAVEEN RAMAPRABHU, University of North Carolina at Charlotte — The interaction of a shock wave with a chemically reacting front is of importance to the design of supersonic combustors and scramjets where mixing from the Richtmyer-Meshkov Instability (RMI) could be tapped to increase combustion efficiency. We will describe results of shock-driven, reacting RMI of a sinusoidally perturbed, single-mode interface separating Hydrogen (fuel) and Oxygen at 300K and 1625K respectively. The non-premixed interface was accelerated by a Mach 1.2 shock traversing from the light (H_2) to heavy (O_2) fluid (Atwood number = 0.5) in a numerical shock tube of aspect ratio 12. The 2D simulations were performed using the compressible flow code FLASH [1], with modifications [2] to handle detailed chemistry and temperature-dependent material properties. The initial thickness of the material interface was systematically varied to study the effect of the diffusion thickness on the flame and instability dynamics. Product formation and heat release as a result of chemical reactions were described according to the 9-species, 19-steps detailed reaction mechanism [3].

[1] B. Fryxell et al., Astrophys. J., Suppl. Ser. 131, 273 (2000)
[2] N. Attal et al., Comput. Fluids (submitted for review)
[3] G. Billet, J. Comput. Phys. 204, 319 (2005)

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