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Shock-driven chemical reaction in phenylacetylene DANA DATTELBAUM, STEPHEN SHEFFIELD, JOSHUA COE, Los Alamos National Laboratory, SHOCK AND DETONATION PHYSICS TEAM, PHYSICS AND CHEMISTRY OF MATERIALS TEAM — Phenylacetylene (PA) comprises a covalently-linked benzene ring and acetylene moiety, presenting an interesting molecular structure for study of shock driven chemical reactions. In the present work, gas gun-driven embedded electromagnetic gauging experiments produced *in situ* particle velocity wave profiles at multiple Lagrangian positions at several shock input conditions. The input shock wave evolves over time and distance into a complex multiple wave structure, with a fast risetime 2^{nd} wave, slower risetime 3^{rd} wave, and unusual wave dynamics in the 1^{st} wave. From the shock and particle velocities, the Hugoniot reaction condition, and intermediate and final states associated with the chemical reactions have been obtained. For example, at shock inputs just above the cusp condition, an induction time of 200 ns was observed, with the evolved first wave traveling at U_s = 4.2 km/s, P = 5.6 GPa; reaction rates of a few to 10 microsec^{-1} were inferred. A thermodynamically complete unreacted equation of state was calibrated to estimate the temperature rise along the shock locus. Use of this EOS with the measured wave risetimes yielded highly state-sensitive global reaction rates.

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