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Reactive wave structures in shock compressed polyimide RACHEL HUBER, DANA DATTELBAUM, LEE GIBSON, Los Alamos National Laboratory, RICHARD GUSTAVSEN, STEPHEN SHEFFIELD, Retired — Polyimide (PI, $(-\text{OC}_2\text{NC}-\text{C}_2\text{O}-)_n$) is a thermoplastic polymer that is chemically-robust at elevated temperatures and pressures thereby lending itself to a multitude of extreme condition applications. When shocked to pressures greater than ~ 18 GPa, PI is suspected to dissociate from polymer structure to a product mixture, due to a “cusp” in the principal Hugoniot. Above the cusp, a multiple wave structure is expected due to volume changes (densification) along the reaction coordinate. From historical work, PI has a volume change of $\sim 20\%$; larger than polysulfone (PSF), and other extended polymer chain structures, for example. To better understand the reactants to products transition in PI, a series of gas-gun driven plate-impact experiments were conducted on PI, and particle velocity wave profiles were measured using both embedded electromagnetic particle velocity gauges and optical velocimetry (VISAR and PDV). Here, we present an analysis and interpretation of the two-wave structure in shocked PI and the loci of the unreacted and product Hugoniot states, as well as the decomposition reaction rate(s). LA-UR-19-21573

Rachel Huber
Los Alamos National Laboratory

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