Abstract Submitted
for the SHOCK07 Meeting of
The American Physical Society

Shock Reactivity of Non-Porous Mixtures of Manganese and Sulfur FRANCOIS-XAVIER JETTE, SAMUEL GOROSHIN, ANDREW HIGGINS, McGill University, SHOCK WAVE PHYSICS GROUP TEAM — Stoichiometric mixtures of manganese powder and sulfur were melt-cast into solid pellets in order to study the mechanism of shock-enhanced reactivity in non-porous heterogeneous mixtures. This mixture was selected due to the large exothermic heat release of the manganese-sulfur reaction (214 kJ/mol), which causes the reaction to be self-sustaining once initiated. The test samples were placed in planar recovery ampoules and a strong shock was delivered via the detonation of a charge of amine-sensitized nitromethane. Various shock strengths were achieved by placing different thicknesses of PMMA attenuator between the explosive charge and the ampoule. The results confirmed that shock-induced reactions can be produced in the absence of porosity. Indeed, the critical shock pressure that caused ignition of the mixture in the ampoule was found to be in the range 2.2 - 3.8 GPa (pressures were estimated using LS-DYNA simulations). In the cases where the shock was too weak to cause ignition in the ampoule, the sample was extracted and its ignition temperature was determined using a differential thermal analyzer.

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Date submitted: 23 Feb 2007 Electronic form version 1.4