

Abstract Submitted
for the SHOCK11 Meeting of
The American Physical Society

Shock Initiation of Powder Mixtures of Aluminum with Dense Metal Oxides FRANÇOIS-XAVIER JETTÉ, SAM GOROSHIN, DAVID FROST, McGill University, FAN ZHANG, DRDC-Suffield — Strong and dense structural reactive materials may be produced by mixing aluminum powders with heavy metal-oxide powders (such as Bi₂O₃, PbO, Pb₃O₄, I₂O₅, etc.). The addition of certain additives to such mixtures, such as V₂O₅ and B₂O₃, can lower the softening point of the oxide mixture below the melting point of aluminum. This could lead to the fabrication of dense and non-porous aluminum-metal oxide structural materials. The shock sensitivity of aluminum-metal oxide mixtures was investigated in this work. The minimum shock initiating pressure was obtained for various porous and non-porous aluminum-metal oxide mixtures using the shock recovery technique. Since most reactions of Al-in metal oxide mixtures produce little pressure and material velocity changes but large increases in temperatures, thermocouples were used to observe the bulk reaction onset, which relates to the overall reaction rate, in those mixtures. The mixtures tested were found to be very sensitive to shock initiation and their reaction rates were found to be very fast, compared to other types of reactive powder mixtures. Finally, the addition V₂O₅ and B₂O₃ additives or the addition of liquid heptane (to fill the pores) did not lower the sensitivity or reaction rates of the mixtures investigated.

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Date submitted: 16 Feb 2011

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