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Comparison of Mechanical and Thermal Ignition Characteristics for Reactivity Enhanced Ni/Al Powders ROBERT REEVES, Purdue University, JEREMIAH WHITE, Notre Dame University, STEVEN SON, Purdue University, ALEXANDER MUKASYAN, Notre Dame University — Efforts have recently been made to understand the ignition mechanism of gasless reactive systems. It has been known that processes such as high-energy ball milling can enhance reactivity through extensive plastic deformation and introduction of crystal defects in the material. Reducing the particle size of the constituent materials to nano-scales also enhances reactivity. However, the effect of such reactivity enhancing processes on ignition mechanisms is not well known. Mixtures of micron size Ni/Al powders, nano-scale Ni/Al powders, and ball milled Ni/Al powders are studied. Differential thermal analysis (DTA) was used to study thermal ignition properties. Ignition by mechanical stimulus was studied by impacting samples with a projectile from a gas gun. DTA showed the ball-milled materials reacted at a temperature below the melting point of Al However these materials could not be ignited through mechanical means. The nano-mixtures reacted at higher temperature than the ball-milled in the DTA, but were readily ignited through mechanical stimulation. This indicates reactivity enhancement affects the thermal and mechanical ignition mechanisms in different ways.

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