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Impact Ignition and Combustion Behavior of Amorphous Metal-Based Reactive Composites[1] LORI GROVEN, BENJAMIN MASON, STEVEN SON, Purdue Unviersity — Recently published molecular dynamic simulations have shown that metal-based reactive powder composites consisting of at least one amorphous component could lead to improved reaction performance due to amorphous materials having a zero heat of fusion, in addition to having high energy densities and potential uses such as structural energetic materials and enhanced blast materials. In order to investigate the feasibility of these systems, thermochemical equilibrium calculations were performed on various amorphous metal/metalloid based reactive systems with an emphasis on commercially available or easily manufactured amorphous metals, such as Zr and Ti based amorphous alloys in combination with carbon, boron, and aluminum. Based on the calculations and material availability material combinations were chosen. Initial materials were either mixed via a Resodyn mixer or mechanically activated using high energy ball milling where the microstructure of the milled material was characterized using x-ray diffraction, optical microscopy and scanning electron microscopy. The mechanical impact response and combustion behavior of select reactive systems was characterized using the Asay shear impact experiment where impact ignition thresholds, ignition delays, combustion velocities, and temperatures were quantified, and reported.

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