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Increasing Combustion Efficiency for Structural Reactive Materials through Design and Processing TONY ZAHRAH, ROD ROWLAND, MATSYS, Inc., ERIN SILVA, DONALD LITTRELL, Air Force Research Laboratory — This paper describes the development of multifunctional materials – materials that are both structural and energetic. These materials typically consist of metal-metal, metal-metal oxide, or metal-oxidizer powder blends that are consolidated into structural components via Hot Isostatic Pressing (HIP), and release energy when explosively shocked via anaerobic (intermetallic or thermitic) reactions and aerobic (particle-air) reactions. The mechanical and reactive properties of the materials were tailored through powder selection and ratios. The powder blends included soft and hard materials, and the volume percent from each material was adjusted to control the consolidation temperature. This paper discusses the use of a unique instrumented-HIP technique to minimize the exposure of the powder blend to high temperature and maximize its combustion efficiency. It will focus on the Al-ALMg material system with discussion of its formulation, HIP processing parameters, mechanical properties, and energy release when explosively shocked.

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