Abstract Submitted
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Two-Component Additive Manufacturing of Nanothermite by Reactive Inkjet Printing[1] ALLISON MURRAY, WHITNEY NOVOTNY, TREVOR FLECK, EMRE GUNDUZ, STEVEN SON, GEORGE CHIU, JEFFREY RHOADS, Purdue University — To broaden the type of energetic materials that can be selectively deposited and improve the safety of their deposition, this work demonstrates the use of combinatorial inkjet printing for the selective deposition of energetic material. Two inert colloidal suspensions of nano-aluminum and nano-copper (II) oxide in dimethylformamide (DMF) with polyvinylpyrrolidone (PVP) were sequentially deposited on a substrate using piezoelectric inkjet printing. By depositing the materials at the same location, in situ mixing produced a reactive nanothermite. This process was continued to produce layers of nanothermite until the desired quantity of material was deposited. Samples with precise geometric control and high fidelity energetic performance were achieved. This work proves the feasibility of reactive inkjet printing as a means for depositing energetic materials from two largely-inert suspensions. In doing so, it opens the doors for safe material handling and the development of a wide array of energetic materials that were previously deemed incompatible with inkjet printing.

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Jeffrey Rhoads
Purdue University

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