

Abstract Submitted
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Flash ignition of nanoaluminum and fluoropolymer composites.

KYLE UHLENHAKE, METIN ORNEK, STEVEN SON, Purdue University — Nanoaluminum (nAl) is known to be sensitive to flash ignition at low packing densities, possibly due to its plasmonic properties as a nanoparticle, where it is suggested the particle absorbs more light energy than it scatters. However, at higher packing densities this energy is more rapidly conducted away, and the particles no longer flash ignite. In this work, the flash ignition of nAl particles incorporated in fluoropolymers such as polyvinylidene fluoride (PVDF) or tetrafluoroethylene hexafluoropropylene and vinylidene (THV). When mixed in a solvent, nAl, PVDF, and THV can be drop cast to produce a full density flash ignitable solid composite in the form of films. The flash ignition is studied through thermal imaging of the particles being flashed, as well as analysis of the fluoropolymer properties when combined with nAl such as piezoelectricity, thermal conductivity, and density. The flash ignition of the particles is also studied as additives in composite propellants, and has shown to be effective at igniting the propellant. This is then compared to the flash ignitability of other propellants with nanoparticle additives.

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