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Preparation and Shock Reactivity Analysis of Novel Perfluoroalkyl-Coated Aluminum Nanocomposites. R. JASON JOUET, JOEL CARNEY, RICHARD GRANHOLM, HAROLD SANDUSKY, ANDREA WARREN, Naval Surface Warfare Center - Indian Head Division — The energy content of current and future explosive and propellant formulations can be increased by elimination of the parasitic oxide present on conventional Al as well as utilization of fluorine as the oxidizer to make Al-F species. Removal of the oxide passivation layer on Al particles will result in an enhancement of the rate of Al combustion. Additional reaction rate enhancement should result from close proximity of the oxidizer and fuel species. Therefore, passivation of Al nanoparticles with molecules containing oxidizer species should produce a final material capable reacting fast enough so the accompanying energy release can contribute to the detonation wave produced by explosive formulations. Passivation of unpassivated, oxide-free aluminum nanoparticles using $C_{13}F_{27}COOH$ is reported with materials containing as much as 32.95 % Al. Characterization data, including SEM, TGA, and ATR-FTIR, indicate that the $C_{13}F_{27}COOH$ molecule binds to the surface of the Al particle protecting the surface from oxidation in ambient air. Small Scale Shock Reactivity Test (SSRT) results of the Al-$C_{13}F_{27}COOH$ material formulated with HMX will be presented.

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