Abstract Submitted
for the SHOCK07 Meeting of
The American Physical Society

Preparation and Shock Reactivity Analysis of Novel Perfluoroalkyl-Coated Aluminum Nanocomposites J.R. JOUET, J.R. CARNEY, J.M. LIGHTSTONE, A.D. WARREN, IHDIV, Naval Surface Warfare Center — The barrier to realization of the energy potential of metals is the comparatively slow rate of oxidation. The rate of oxidation is governed by diffusion of the fuel and oxidizer species. For Al, the Al_2O_3 surface oxide further slows this process. Replacement of this layer with organic molecules containing oxidizer species should result in a material that reacts fast enough to enable the energy release to contribute to explosives detonation. Passivation of unpassivated, oxide-free Al nanoparticles using $C_{13}F_{27}CO_2H$ and $C_{15}F_{29}CO_2H$ forming self assembled monolayers (SAMs) is reported with materials containing as much as 33 % Al. The fast reaction capability of the SAM-passivated material was investigated using time-resolved emission measurements of laser ablation experiments. Laser ablation can transfer momentum to a surface, since the ablated material applies a pulse of high pressure to the surface underneath it as it expands. Time-resolved emission results of the SAM-passivated materials were compared with oxide passivated Al nanoparticles coated with the same acids, $C_{13}F_{27}CO_2H$ and $C_{15}F_{29}CO_2H$.

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Date submitted: 27 Mar 2007 Electronic form version 1.4