

MAR15-2014-020430

Abstract for an Invited Paper
for the MAR15 Meeting of
the American Physical Society

Field responsive shear thickening fluids for personal protective equipment and MMOD shielding for spacecraft and astronauts¹

NORMAN WAGNER, University of Delaware / STF Technologies LLC

Shear thickening fluids (STFs) are novel, field responsive materials and have been shown to provide enhanced ballistic and puncture resistance when integrated into nanocomposites. In this talk, I will review the basic principles of shear thickening in colloidal dispersions by introducing new, recent results describing the unique material functions of the shear thickened state and how these material functions relate to those observed in simulation and experiments, as well as models for these material functions and their dependence on particle concentration. Next, performance data for STF-Armor(TM) nanocomposites (STF intercalated with aramid and other textiles) in puncture, ballistic and hypervelocity impact experiments, as well as energy absorbing impact experiments, will be shown and related back to the material properties of the STF fluids. Finally, advances in product development to achieve suitable puncture resistance for novel applications such as puncture resistant surgical gloves (STF Technologies LLC) will be presented along with challenges for the future product development.

¹Support from NSF STTR # IIP-1346269 and NASA NNX11AQ28A is gratefully acknowledged.