15th International Conference and Exhibition on
MATERIALS SCIENCE AND ENGINEERING
&
3rd International Conference on
APPLIED CRYSTALLOGRAPHY November 07-08, 2018 | Atlanta, USA

Rugged nanoparticle tracers for mass tracking in explosive events

Lance Hubbard
Pacific Northwest National Laboratory, USA

Tracing the flow of solid matter during explosions requires elements with uniquely identifiable signatures. Pigments tagged with luminescent core-shell nanoparticles (CSNPs) can have tunable photoluminescence (PL) depending on the material composition and core/shell thicknesses. The particles can be ruggedized with thick silica encapsulate to protect the luminescent inner architecture during finite periods of elevated temperatures. Incorporation of the CSNPs into a matrix allows for identification (ID) of debris originating from the tagged material. Five types of zinc sulfide quantum dots were synthesized and isolated in silica shells. The shelled dots were molecularly bound to five commercially obtained luminescent powders. The combination of 5 dots and 5 powders enables a matrix of 25 unique pigments that can be applied for mass tracking and model confirmation. The 25 pigments have spectral components that luminesce under different wavelengths. The use of commercial pigments enables field identification for collection and CSNPs allow for laboratory confirmation of the origin of the mass. The bound powders and luminescent CSNPs were suspended in a hydrated silica gel pending incorporation into materials. Finally, the mass tracking pigments were incorporated into temperature resistance paints, synthetic stone and controlled porous glass. The incorporation of temperature resistant CSNPs and commercial pigments has enabled unique identifiers, which allow for the tracking of mass through explosive events and other inaccessible environments.

Biography

Lance Hubbard has completed his PhD in Chemical Engineering from the University of Arizona. He is currently a staff materials scientist at Pacific Northwest National Laboratory focusing on nanomaterial integration and semiconductor-based detector design. He has papers and patents related to nanomaterials integration into semiconductor processes, corrosion of ceramics under monatomic oxygen, electroless deposition of metals and Raman/radio interference based spectroscopy for industrial process control. Current research includes studies on nanoparticles for mass tracking, production modeling of uranium fuel foils and AlGaN avalanche photodiode structures.

lance.hubbard@pnnl.gov

Notes: