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Using Sedimentation Field Flow Fractionation (sed-FFF) to Study Particle Behavior of Tracers and Metallic Components in a Chemical Explosions

BRANDY GARTMAN[1], LANCE HUBBARD[2], ANJELICA BAUTISTA[1], MARTIN LIEZERS[2], JARROD CRUM[1], TRENT GRAHAM[2], STONY T AKINS[2], CAROLYNE A BURNS[2], JOSHUA A SILVERSTEIN[2], APRIL J. CARMAN[1], MICHAEL FOXE[2] AND CAROLYN SEIFERT[2]

[1]Pacific Northwest National Laboratory
[2]Pacific Northwest National Lab

In a chemical explosion, materials will undergo various physiological changes which can include melting, explosive welding/fusion, condensing, etc., whereby the resulting debris will have a different identifying signature than the ingoing materials. A team at the Pacific Northwest National Laboratory has synthesized luminescent Quantum Dot (QD) tracers that can withstand extreme temperatures and pressures to study particulate movements during an explosion [1-4]. However, quantification of these tracers can be complex especially when mixed with environmental materials making them hard to locate. Therefore, a method has been in development to use sedimentation Field Flow Fractionation (sed-FFF) as a means of studying particle behavior and transport of the luminescent QD or other materials that can be found in the resulting debris fields. This instrument has not been previously used to study particulate movement from complex matrices whereby details of this method development will be discussed. Data collected from these studies will demonstrate how sed-FFF can be leveraged to understand particle transport of materials by concentrating debris into unique particle bins. This non-destructive technique can be coupled to analytical methods like scanning electron microscope (SEM), ultraviolet-visible (UV-Vis) spectroscopy, dynamic light scattering (DLS), photoluminescence spectroscopy, and inductively couple plasma mass spectrometry (ICP-MS) as a means of locating, quantifying, and characterizing changes to morphology or chemical composition of the resulting debris following a chemical explosion.

References:

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