

UNIVERSITY OF RHODE ISLAND
Department of Chemistry Ph.D. Seminar

2:00 PM, Friday, April 28, 2023
Beaupre Room 105

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Plasticized Pyrotechnic
Formulations

HOST
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Plasticized Pyrotechnic Formulations

Law enforcement and military personnel must often respond to complicated challenges, and they must be prepared to deal with explosives, unidentified chemicals, and even chemical warfare agents (CWA). When dealing with CWA, any exposure may be life-threatening, and any attempt to destroy CWA must ensure the method itself does not spread contamination. Flexible plasticized pyrotechnic formulations that burn with high heat release but without detonation can allow for controlled destruction of CWA. Moreover, such pyrotechnics may provide a safe and fast method for destruction of sensitive information (laptops and documents). In the case of CWA, the pyrotechnic formulation must burn hot enough to melt through lightly cased containers, so that responders do not need to open them. In the cases of biological threats, the pyrotechnic should also release a biocide, e.g., a halogen, in addition to heat. In rating chemicals in terms of burn rate, heat release or explosive potential, the focus is usually on the anion since it is the species that carries the oxygen. However, in the final formulation the contribution of each species of the oxidizer and the fuel must be considered. In seeking a flexible polymer in which to incorporate energetics, the viscoelastic behavior and rheological properties were determined using a Rheometer (TA Instruments). Heat release and thermal behavior of the formulations was determined by DSC (Differential scanning calorimetry), SDT (Simultaneous DSC and TGA), and bomb calorimetry. Finally, halogen generation was detected and quantified by colorimetric tests, UV/VIS spectroscopy, and Raman spectroscopy.