

S&T Campaign: Sciences for Lethality and Protection

Kinetic Lethality

Effects on Target

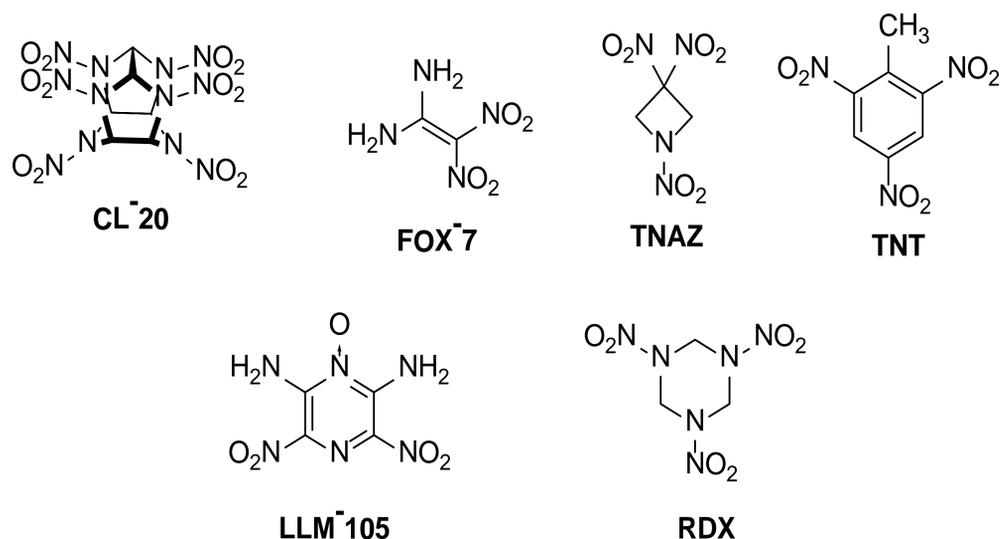
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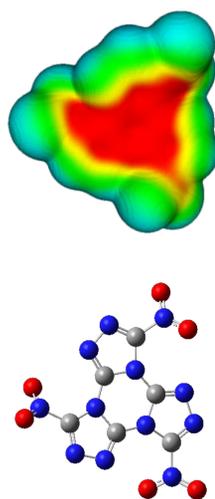
Research Objective

Develop novel energetic materials with reduced sensitivity for improved warhead effectiveness and sustainability



Challenges

- Determination of targets having the required characteristics to be of military value
- Emerging energetic materials show promise as high-energy insensitive materials, but efficiency/feasibility of synthesis is unknown while many routes for the materials often involve numerous, costly steps
- Compatibility, performance of novel energetic materials with conventional binders not known



Modeling



Synthesis



Product

Descriptive figure caption

ARL Facilities and Capabilities Available to Support Collaborative Research

- Small scale to pilot scale explosive synthesis capability.
- Access to super computer clusters for modeling and simulation
- Relevant Publications:
 - Sherrill, William M.; Johnson, Eric C.; Paraskos, Alexander J. Synthesis and Characterization of Mono-, Di-, and Tetranitrated 7,8-disubstituted Glycolurils Propellants Explos. Pyrotech., 2014, 39, 90-94. First published online 21 August, 2013.
 - Sherrill, W. M.; Johnson, E. C. An alternative method for the production of tetranitroglycouril via decomposition of N,N'-dinitrotetrahydroimidazo[4,5-d]imidazole-2,5)1H,3H)diimine, diimine hydrochloride, or diimine nitrate and elimination of dinitrogen oxide gas ARL Patent Docket ARL-14-18 January 2014.
 - Sherrill, W. M.; Banning, J. E. Process for Production of Spherical Tetranitroglycouril ARL Patent Docket ARL-14-19 January 2014.

Complementary Expertise / Facilities / Capabilities Sought in Collaboration

- X-ray crystallography capability
- Synthetic organic chemists for the synthesis of non-energetic scaffolds
- Expertise in organometallics or organic synthesis
- Research Strategy:
 - Employ molecular modeling techniques to assist with target determination.
 - Make use of fundamental organic chemistry principals while exploring alternative synthesis routes to reduce steps and waste in multistep synthesis of promising novel energetic materials
 - Explore formulations of novel energetic materials with standard binders