

A CONUS Manufacturing Source for Critical Chemical HNS

A2776 — Development of HNS Manufacturing Process

Objective

Many of the currently fielded air- and surface-launched Navy missile programs were initially developed decades ago. These programs may experience material obsolescence, discontinued products, inconsistent quality of material from the manufacturers and diminished manufacturing sources.

Hexanitrostilbene (HNS) is a thermally stable explosive. It is identified as a critical chemical by the Department of Defense (DoD). It has application in 47 weapon systems such as AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM), Hellfire, Guided multiple launch rocket system (GMLRS), Sidewinder, cartridge actuated devices (CAD) / propellant actuated devices (PAD) Air Crew Escape System, etc. Currently, there is no continental United States (CONUS) source of HNS to meet the projected needs of DoD.

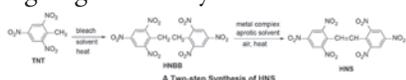
The established process for the production of HNS is the classic one-step Shipp procedure. This process typically produces a crude yield of 30-50 weight percent that requires further purification and results in substantially lower overall yield. A two-step process (Modified Shipp Process) for small-scale synthesis of HNS is also reported in open literature. The first step is the synthesis of the intermediate hexanitrobibenzyl (HNBB) and the second step is the oxidation of HNBB to HNS. The objective of this Energetics Manufacturing Technology (EMTC) project is to make the two-step process feasible at kilogram quantities and to obtain HNS at a higher yield and purity than the regular Shipp process. By making HNS in large scale at higher yield and purity, the production cost will decrease. This will provide the Navy and DoD with a reliable and cost-effective CONUS source of HNS.

Payoff

Successful production of HNS at Naval Surface Warfare Center Indian Head Division (NSWC IHD) will provide the DoD with a reliable and cost-effective CONUS source of this critical energetic material.

Implementation

The successful results of this ManTech project will be used to provide multi-pound quantities of HNS-I and HNS-II. These quantities will be used to validate the material utility in final (type) qualification studies for existing as well as future applications. A two-step synthesis of HNS at multi-liter scale has been developed at NSWC IHD; each step was optimized for high yield, safety and ease of production. The first step of the process (i.e., production of HNBB) has been performed in multi-pound scales and has been optimized. The second step of the process (i.e., production of HNS) in pound quantity is the target of the current project. Additionally, the currently produced HNS is undergoing the many different tests required by the military specification.



PERIOD OF PERFORMANCE:
November FY018 to December
FY2026

PLATFORMS:
Energetics /
cartridge actuated devices (CAD) /
propellant actuated devices (PAD)

CENTER OF EXCELLENCE:
Energetics Manufacturing
Technology Center (EMTC)

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