

Cost Effective Binder for Shock Survivable Explosives

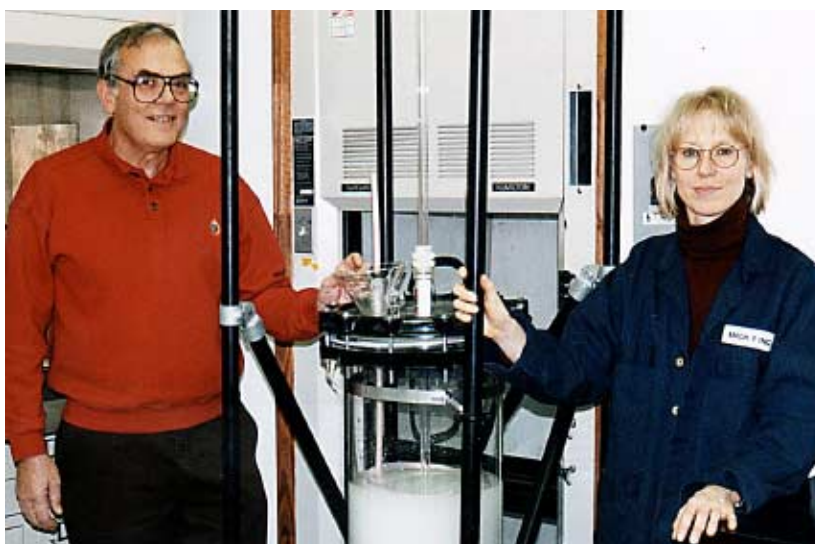
Company:
MACH I, Inc.

Location:
King of Prussia, PA

Employees:
15

President:
Bernie M. Kosowski

Project Officer:
Lt. Danielle Robitelle
AFRL Munitions
Directorate



Dr. Gary Statton and
Dr. Anja Ruebner of
MACH I standing next
to a reactor containing
Poly Cyclodextrin.

Air Force Requirements:

The Air Force has a continuing requirement to safely handle and store energetics as used in explosives and munitions. It took advantage of the Small Business Innovation Research (SBIR) program to explore new forms of energetic chemicals. These chemicals maintain desirable explosive properties while lessening accidental detonation by shock, fire, fragment impact, or storage degradation.

Innovative Technology:

MACH I, Inc. was awarded SBIR Phase I and II contracts to develop polymers of cyclodextrin, a type of sugar derived from cornstarch. When nitrated this compound forms a new type of reduced sensitivity energetic which can encapsulate or bind other component explosives such as nitroglycerine. This new technology offers the Air Force the potential of a cost effective binder for shock survivable explosives. As the storage sensitivity of the energetic in the munition is improved, substantial additional benefits occur regarding the transportation and storage criteria for these munitions. Initial research by the US Navy established the desensitizing properties of nitrated cyclodextrin. However, the formulated energetic was a liquid, not the solid desired by the Air Force. By constructing a higher molecular weight polymer from cyclodextrin molecule, MACH I was able to solve the practical problem of how to incorporate this new technology into a solid form. MACH I's research resulted in a new, environmentally friendly

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explosive material having high energy but less sensitivity. Raw material costs are kept low because comstarch is the starting ingredient. Life cycle costs are also projected to be low because of the ease of demilitarization.

Company Benefits:

The polymers of cyclodextrin (Poly CD) that MACH I developed in this SBIR research demonstrate excellent potential for use in both explosive munitions and as a clean burning solid rocket propellant. Unique non-military uses may also exist for these polymers as possible encapsulating carriers for food additives, fragrances, and vitamins. On-going evaluations sponsored by the Ben Franklin Technology Center and performed with assistance from the Peptide Synthesis facility at The Wistar Institute, Philadelphia, PA confirm their potential as pharmaceutical carrier polymers.

Company Quote:

“The Air Force SBIR Program provided MACH I critical support and assistance in allowing us to pursue advanced development research. MACH I is now in the process of establishing a pilot production unit and transitioning into a Phase III business venture. Existing commercial supplies of feedstock, nitration conversion capacity, and ordnance packaging will allow for quick and inexpensive commercialization.”

Bernie Kosowski
President
MACH I, Inc.

SBIR

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