Development of an Epoxy Resin Bonded Explosive - Interim Report

P. Archibald

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TO: Barney Rubin/Gus Dorrough

FROM: Paul Archibald

SUBJECT: Interim Report on the Development of an Epoxy Resin Bonded Explosive

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Summary: This report summarizes the work done to date on the development of an epoxy resin bonded explosive (HMX). The original target values have been satisfied and further investigations will be on a semi-pilot plant scale.

The following characteristics have been determined on laboratory specimens.

	<u>Target Value</u>	<u>*PBA</u>
Compressive Strength	10,000 psi	11-12,000 psi
Sensitivity (50% height)	Equivalent to Comp.B which is 33.0 cm.	31 cm
Density gms/cc	1.80 or higher	1.81
Vacuum Stability (cc gas/gm/24 hrs. at 100°C)	.5 cc/24 hrs.	.42 cc/gm

*Design of epoxy resin bonded HMX mixtures.

Formulation:

The optimum formulation developed consisted of 6% of the following resin mixture as a binder and 94% of ground HMX.

Epon 828	70 pts.
Versamide 125	30 pts.
DETA	7 pts.

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The above binder formulation contains a room temperature catalyst. The pot life of such a mixture is dependent to a considerable extent upon the mass of material involved and whether an exotherm will develop. Although a mass of 100 gms. in a container has a pot life of around one hour, when mixed with HMX in the amount of 6%, the exotherm does not develop and the pot life is extended for several days. The use of such a catalyst reduces the press time to 10 minutes at 100°C instead of several hours as is required by the oven curing catalysts.

Preparation of Specimens:

Specimens were produced by mixing intimately the catalyzed resin and HMX by grinding in a mortar and screening to break up aggregates. The powder which at this point appears slightly damp is poured into the cold die and 30,000 psi is applied. The die is then brought to 100°C and held for ten minutes. After cooling, the specimen is extruded from the die. The specimen may then be post cured for several hours at 100°C. (The optimum post cure has not been determined, but it does not appear to be critical.)

While specimens of good mechanical strength can be made by extruding the uncured epoxy HMX from a cold die and post curing, the density of such specimens is around 1.78 instead of 1.81, which is obtainable by curing under pressure.

The use of a vacuum while pressing was not found to increase the density of specimens. It was also determined that a double acting press, i.e. one with ram movement from both ends, produced a stronger, denser specimen.

Paul Archibald

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