Characterization of PADAP

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CHARACTERIZATION OF PADAP

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ABSTRACT

A single batch (No. 4-60-IV) of PADAP supplied by Sandia Corporation was analyzed to determine its suitability for a specific detonator application. Results of five tests on the explosive are reported. By these tests, PADAP appears to be generally too insensitive for such detonators.

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DISCUSSION

The following tests were performed on PADAP: impact sensitivity, spark sensitivity, Henkins, DTA, and surface area determination. A summary of the results is shown in Table I.

The PADAP showed an impact sensitivity comparable to 9404 and it was essentially the same in both the 12A and 12B tests.

The material showed no well defined cut-off point in spark initiation, but rather simply a decreasing degree of combustion for decreasing spark energies. Obvious detonation (fracture of the HE container) occurred only for spark energies greater than 2.1 joules. However, applying the standard criterion for distinguishing between a "go" and a "no go" (i.e., "go" if the pressure released broke the tape seal on top of the HE container) reduced the 50% level to 1.0 joule, which is of the same order of magnitude as PETN.

Some difficulty was experienced obtaining consistent data for the Henkin's (explosion temperature) test. Lead plugs were used to seal the HE containers and it appears that the difficulty was caused by softening of these plugs at the temperature of the PADAP exotherm, which is near the melting point of lead. The plugs would then slip, releasing pressure and increasing the time to detonation. Sealing the tubes with two plugs resulted in repeatable times, but this also significantly changed the heat capacity of the container. Therefore these data were not included in the analysis. Using steel plugs might have alleviated the slippage problem but, again, would have changed the parameters of the container system and invalidated any comparison with tests performed using lead plugs. The best data obtained are shown in Fig. 1.

Table I

Results

A. Impact Sensitivity (2.5 Kg drop hammer)¹

Test type	H ₅₀ (cm)	σ
12A	41.9	0.08
12B	43.1	0.05

B. Spark Sensitivity (see text)

Gap	2.0 mm
Voltage	5.0 Kv
E ₅₀	1.0 Joule

C. Henkin's (see Fig. 1)

D. DTA (see Fig. 2)

E. Surface Area² (gas adsorption method) 16,340 cm²/gm

¹Data obtained by P. E. Kramer

²Data obtained by A. A. Duncan

Henkin's Test

Fig. 1

Fig. 2. DTA Thermograph of PADAP

A DTA thermogram showed an endotherm at 245°C and an exotherm at 290°C with a stable baseline from ambient to the endotherm temperature (shown in Fig. 2).

A surface area of 16,340 cm²/g was measured by the gas adsorption method using a Perkin-Elmer adsorptometer.

FUTURE WORK; COMMENTS; CONCLUSIONS

In doing Henkin's test on materials such as PADAP with a high temperature exotherm it will be necessary to replace the lead plugs with some other type. Tests using these plugs should then be made on standard explosives to provide reference data against which new materials may be compared.

This evaluation of PADAP is terminated. It appears the material is not suited for use in the specific type of detonators in question. No further testing is anticipated.