

MASTER

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TATB PERFORMANCE AND SENSITIVITY

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DEVELOPMENT DIVISION

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ABSTRACT

Gap tests conducted on three batches of Teledyne-produced TATB revealed a wide sensitivity range. Impurities are probably responsible for the variation.

LLL Blend 6 was tested at three densities to provide a check on the data for LLL Blend 2. Blend 6 was slightly more sensitive than Blend 2.

Routine tests of RX-03-BB Blends 6 and 7 revealed nothing unusual.

Better results were obtained in the hot (68 C) wedge tests on RX-03-BB but more improvement is needed.

DISCUSSION

GAP TESTS

Three of the experimental TATB batches produced by Teledyne were selected for gap testing. These were all rather fine distributions and contained appreciable impurities or discoloration.

Teledyne Batch 2 (amination in toluene) had poor pressability, and sensitivity was among the lowest thus far for binderless powders (see Table I). The pressed powder was brown rather than yellow.

Teledyne Batch 18 (amination in a 1/5 methanol/ethylene dichloride solution) was poorly pressable and yielded dark orange pellets. Despite these similarities to Batch 2, Batch 18 was the most sensitive powder tested to date.

Batch 9 (amination in methylene chloride) was gold, pressed fairly well, and was indistinguishable from the LLL blends in sensitivity.

Throughout this testing program results for binderless powders have been compared to a series of tests conducted on LLL Blend 2. Since the methods for producing the LLL blends are designed to yield a consistent product it has been assumed that the results for Blend 2 would be typical for all LLL blends. A series of tests was conducted on Blend 6 to test this assumption. At all three test densities the G_{50} for Blend 6 was about 7% greater than for Blend 2. This is close enough agreement to indicate that the LLL blends are consistent enough in gap sensitivity to provide a standard of comparison for pure TATB, with an average of the results for Blends 2 and 6 being used as that standard.

RX-03-BB lots made with Blends 6 and 7 were also tested at nominal pressed density. These displayed a barely resolvable (~ 0.3 mm) increase in sensitivity over previous lots made with LLL blends. A trend toward slightly increased sensitivity of RX-03-BB has been detected recently in several small batches produced to examine the effects of particle size distribution.

Table I. TATB Gap Test Results

HE	Fabrication ^a	Density (Mg/m ³)	G ₅₀ (mm of Brass)	
			Observed	Expected
TATB Teledyne Batch 2	P	1.844 ± 0.002	5.54	7.7
TATB Teledyne Batch 9	P	1.856 ± 0.001	6.81	6.5
TATB Teledyne Batch 18	P	1.838 ± 0.001	11.00	8.3
TATB LLL Blend 6	P	1.862 ± 0.001	5.87	5.6
TATB LLL Blend 6	P	1.797 ± 0.001	12.19	11.5
TATB LLL Blend 6	P	1.697 ± 0.001	15.10	14.2
RX-03-BB Blend 6	M	1.902 ± 0.001	2.16	1.9
RX-03-BB Blend 7	M	1.901 ± 0.001	2.24	1.9

^aP - Pressed to Shape
M - Machined to Shape

Table II. Wedge Test Results for RX-03-BB @ 68 C^a

$$\rho_{AMB} = 1.900 \text{ Mg/m}^3 \quad \rho_{68} \sim 1.88 \text{ Mg/m}^3$$

Average Detonation Velocity $\sim 7.51 \text{ km/s}$

Transmitted Pressure (GPa)	Distance to Detonation (mm)	Time to Detonation (μs)	Excess Transit Time (μs)
10.5	8.1	1.57	0.49
14.1	5.1	0.94	0.26

^aSuspicious data: more tests to be conducted

WEDGE TESTS

It now seems almost certain that the problems encountered on the hot RX-03-BB wedge test were caused by bonding problems between the driver plate and the explosive wedge. Taking particular care in this area, two more shots were assembled and fired.

Examination of the framing camera records showed that one of the tests looked good while the other, although clearly better than earlier tests, was only fair. When the streak camera records were analyzed (Table II), the resulting points did not fit the trend of the earlier RX-03-BB test series. When only two points exist, it is difficult to establish where an error lies, but the test at 10.5 GPa would seem to be the most suspicious. This is also the test with the poorer framing camera record. Two more attempts to obtain believable data will be made. If these fail, the hot wedge series may be abandoned.

FUTURE WORK; COMMENTS; CONCLUSIONS

The gap tests with TATB produced by Teledyne indicate that processing techniques can significantly affect the sensitivity of binderless powders. These three batches will be used to produce three batches of RX-03-BB.

Results obtained thus far with RX-03-BB have indicated that the sensitivity of the TATB used is rather unimportant. Sensitivity of RX-03-BB appears to be a function of density alone. The large sensitivity range exhibited by these three powders will thus provide some very interesting data and a critical check on the RX-03-BB sensitivity/density generalization.

RX-03-BB Blend 8 has been formulated but poor physical properties require reformulation. Gap tests will be done with both the unacceptable and acceptable material. Based on data gathered thus far, no sensitivity difference is expected.