GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: July 17, 1973

Project Title: Determine Relative Energy Content of Thermites

Project No.: A-232-664

Project Director: Dr. M. D. Bowen

Sponsor: Thiokol Chemical Company

Effective July 15, 1973 . . . . . Estimated to run until: Open

Type Agreement: Purchase Order No. 24725 . . . . . Amount: $ 500

SPONSOR CONTACT:

Administrative	Technical
Delores Hamilton	W. L. Ellington

Thiokol Chemical Corp.
Post Office Box 428
Woodbine, Georgia 31569
(912) 265-0180

Assigned to Technology Applications Group

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GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION

PROJECT TERMINATION

Date: March 9, 1976

Project Title: Determine Relative Energy Content of Thermites

Project No: A-232-664

Project Director: Dr. M. D. Bowen

Sponsor: Thiokol Chemical Co.

Effective Termination Date: 1/1/76

Clearance of Accounting Charges: all have cleared

Grant/Contract Closeout Actions Remaining:

None

Assigned to: Productivity Technology Applicatinns Laboratory

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Form EES 402 (R10–75)

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ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

July 25, 1973

Mr. W. L. Ellington
Manager, Labs and Engineering
Thiokol, Georgia Division
P. O. Box 428
Woodbine, Georgia 31569

Dear Mr. Ellington:

I have completed an investigation concerning a group of Boron Potassium Nitrate Type C Pellets received by express shipment on July 20, 1973, and labeled as follows:

Lot 2-13	20 pellets--Low Weight Range
Lot 2-13	20 pellets--Medium Weight Range
Lot 2-13	20 pellets--High Weight Range
Lot 2-14	20 pellets--High Weight Range

Your letter enclosed mentioned Lot 2-15 in the context, but the sample bag read "Lot 2-14 C Pellet."

Two tests were run on these pellets. A weighing was performed on a Torbal analytical balance whose sensitivity is $\pm$ 0.1 mg. A near-infrared photometric integrated output was performed on individual pellets after being weighed. Detailed descriptions of each test precedes the data in Table I. A summary of data results is shown in Table II. A presentation of weight versus relative power output is shown in Table III. This data was derived by subdividing two pellets from Lot 2-13 high range and is shown to demonstrate the linear relationship between weight and power output. Three mean values taken from Lot 2-13 data in Table II were included in Table III to yield a whole pellet point in the data.

Procedure

A. Weighing

Weighing was done on a Torbal analytical balance with a sensitivity of 0.1 mg. Each pellet was weighed and numbered to identify it for a subsequent firing test.

B. Relative Power Output

It was thought that by integrating the total flash output of each pellet over a range of 0.4 to 2.0 microns wavelength that a relative power output could be inferred from the data. An instrument named Opto-Meter Model 40A by United Detector Technology is a wide wavelength range integrating photometer with a 50 nanosecond minimum response time, and was used for integrating the total flash output of each pellet and holding the integrated value until recorded. The sensor in the Model 40A is a 1 cm^2 unfiltered silicon PIN diode whose peak response is near 1.1 microns wavelength.

The pellets were ignited on a hot gauze above a crucible furnace. The optical sensor was placed 12 inches away and a neutral density 1.0 filter was placed in the light path to attenuate uniformly the bright output on the sensitive detector. This filter is uniformly absorbing from 400 to 2000 mu.

The data is expressed as relative power output with the highest observed reading being unity (1.00). This data is presented in Table I.

C. Data Reduction

Only a simple standard deviation and percent of mean was derived from the data and is presented in Table II.

Sincerely,

David R. Hurst
Research Technician III

ct

Attachments

TABLE I

RELATIVE OUTPUT POWER AND WEIGHT DATA

Sample No.	LOT 2-13 Low Range Relative Power	LOT 2-13 Low Range Weight (mg)	LOT 2-13 Middle Range Relative Power	LOT 2-13 Middle Range Weight (mg)	LOT 2-13 High Range Relative Power	LOT 2-13 High Range Weight (mg)	LOT 2-14 High Range Relative Power	LOT 2-14 High Range Weight (mg)
1	.64	67.2	.38	67.7	.11	68.7	.68	72.5
2	.38	70.4	.50	71.5	.32	-	.68	72.5
3	.55	70.5	.66	68.9	.66	68.7	.54	72.5
4	.40	70.2	.47	69.9	.42	68.8	.63	73.3
5	.40	67.3	.42	68.0	1.00	68.7	.51	74.0
6	.62	65.6	.52	66.2	.52	72.0	.72	72.0
7	-	69.3	.42	66.8	.51	68.7	-	74.0
8	.62	68.6	.30	63.8	.30	70.2	.56	74.5
9	.34	66.3	.42	67.2	.54	67.4	.54	74.5
10	.40	64.6	.75	72.0	.70	69.1	.64	73.2
11	.65	70.1	-	68.2	.62	73.3	.41	73.2
12	.28	70.0	.41	68.7	.50	67.3	.50	74.2
13	.48	71.0	.68	67.4	.41	69.5	.40	75.2
14	-	69.5	.41	67.8	.52	70.0	.42	74.5
15	.35	72.0	.58	70.8	.46	69.7	.48	71.4
16	.38	68.7	-	66.2	.30	-	.30	74.5
17	.42	67.8	.47	67.0	-	-	.56	73.0
18	.50	71.2	.44	68.6	-	-	-	-

TABLE II

STANDARD DEVIATION SUMMARY OF DATA

Sample Lots	Relative Power				Weight Milligrams			
	N	Mean	SD	%SD	N	Mean	SD	%SD
2-13 Low Range	16	.463	.119	25.8	18	68.9	0.20	2.93
2-13 Middle Range	16	.489	.121	24.7	18	68.2	0.20	2.95
2-13 High Range	16	.493	.202	40.9	14	69.4	0.16	2.32
2-14 High Range	16	.530	.116	21.8	17	73.4	0.11	1.44

TABLE III

RELATIVE OUTPUT POWER AND VARIABLE WEIGHT DATA

Sample No.	Relative Power	Weight (mg)
1	.110	20.5
2	.280	37.0
3	.400	47.1
4	.463	68.9
5	.489	68.2
6	.493	69.4