THERMAL CONDUCTIVITY OF TATB AND TATB
BLENDS BY DIFFERENTIAL SCANNING CALORIMETRY

Billy D. Faubion

DEVELOPMENT DIVISION

APRIL - JUNE 1976

Normal Process Development
Endeavor No. 106

MASTER

Mason & Hanger-Silas Mason Co., Inc.
Pantex Plant
P. O. BOX 647
AMARILLO, TEXAS 79177
806-335-1581

operated for the
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
under
U. S. GOVERNMENT Contract DA-11-173-AMC-487(A)

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately-owned rights.

1-307

THERMAL CONDUCTIVITY OF TATB AND TATB BLENDS BY DIFFERENTIAL SCANNING CALORIMETRY

Billy D. Faubion

DEVELOPMENT DIVISION

April - June 1976
Endeavor No. 106

NOTICE
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

MASTER

INTRODUCTION

The measurement of thermal conductivity of polymers by DSC has been reported(1, 2).

Two methods are given in Reference 1, one based on a standard of known thermal conductivity, and one based on a somewhat simplified method, using only the unknown sample. In this report the second method has been used to measure the thermal conductivity of two samples of TATB and two blends of TATB with Kel-F.

EXPERIMENTAL

A thermal conductivity device was constructed from the description given in Reference 1 and was used with the Perkin-Elmer DSC-1. A zero baseline was established by operating the DSC with the digital temperature setting corresponding to ambient temperature. Once the baseline was achieved the digital setting was reset to a higher value (i.e., 40 C) and the DSC output measured.

The thermal conductivity was then calculated as follows:

$$\kappa = \frac{(q \text{ cal sec}^{-1}) (L \text{ cm})}{(A \text{ cm}^2) (T_2 - T_1)}$$

where q = DSC output
 L = Length of pellet
 A = Cross sectional area of pellet
 T_2 = DSC Setting
 T_1 = Temperature of the heat sink.

Two 6.35 mm diameter x 6.35 mm long pellets each were pressed from two batches of TATB and two blends of TATB with Kel-F.

RESULTS

The thermal conductivity values for the eight pellets are listed in Table I. The heat sink temperature was 26 to 27 C and the DSC setting was 40 C (313 K). These values are reasonable and compare with the value given by Rogers for TATB(3).

-
- (1) W. P. Brennan, B. Miller and J. C. Whitwell, *J. Appl. Polymer Sci.*, 12 (1968) 1800.
 - (2) F. N. Larsen and C. L. Long, "Determination of Thermal Conductivity of Selected Materials by Differential Scanning Calorimetry," *The Bendix Corporation, Kansas City, MO*, 1975.
 - (3) Raymond N. Rogers, *Thermochimica Acta*, 11 (1975) 131.

Table I. Thermal Conductivity of TATB and TATB
Blends by DSC

<u>Sample</u>	<u>Batch No.</u>	<u>ρ gcm⁻³</u>	<u>$\kappa \times 10^4$ cal cm⁻¹ sec⁻¹ deg⁻¹</u>
TATB	6064-16-01 (1)	1.8410	11.2
TATB	6064-16-01 (2)	1.8576	11.0
TATB	6072-16-01 (1)	1.8263	10.4
TATB	6072-16-01 (2)	1.8273	10.7
RX-03-AU	5246-141-01 (1)	1.8911	12.0
RX-03-AU	5246-141-01 (2)	1.8889	12.6
RX-03-BB	5218-145-01 (1)	1.8930	12.2
RX-03-BB	5218-145-01 (2)	1.8930	11.9