

IDENTIFICATION OF SILICONE OIL/PETN INTERACTION

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DEVELOPMENT DIVISION

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ABSTRACT

Infrared and UV spectra have been obtained on oils pressed from GE5601 silicone rubber. A method for depositing oil on PETN has also been investigated. In order to determine if the oil was evenly deposited on the PETN, an analytical method was developed for determining the concentration of oil on PETN.

INTRODUCTION

An investigation of the oils exuded from GE5601^a silicone rubber is proceeding according to the general outline submitted by J. G. Harlan of Sandia Albuquerque. Work completed has been divided into three areas: 1) collection of sufficient quantities of exuded oils for examination, 2) infrared and UV analysis of the oils, and 3) development of a method for uniform deposition of oil on PETN in known quantities. These three endeavors are discussed in separate subsections.

COLLECTION OF EXUDED OILS

Sufficient quantities of oil for analysis have been pressed from two samples of GE5601 rubber obtained from Sandia, Albuquerque on February 19, 1971. One sample had been cured using the Varox^b catalyst and the other cured with the Cadox TS-50^b catalyst. The Varox catalyst is 2,5-dimethyl-2,5-di(tert-butyl-peroxy)hexane used either as a powder or in solution.

Cadox TS-50 is a peroxide paste catalyst containing 50% 2,4-dichlorobenzoyl peroxide, 37-1/2% GE SF96^c and 12-1/2% dibutylphthalate. Less than 0.25% water may also be present.

The exuded oils were collected on filter paper layered with 6 cm patties of rubber and compressed between two stainless steel plates. Approximately one ton (anvil pressure) was applied with a 30 ton R.I.I. press^d. The assembly was held in compression with four bolts and placed in a sealed container at ambient temperature and pressure. After approximately 100 hours, the apparatus

^a General Electric Corporation, Silicone Products Division, Waterford, New York.

^b General Electric Corporation, Silicone Products Division, Product Information Pamphlet RHB-4B.

^c A General Electric polydimethylsiloxane equivalent to Dow Corning DC200.

^d Research and Industrial Instruments Company, London, England.

was disassembled and the filter paper extracted with chloroform. The Soxhlet extractor was washed with Uresolve Plus^e, water and acetone to remove any silicone grease from the ground glass joints. The extractor was used with dry joints.

SPECTRAL ANALYSIS OF OILS

Infrared and UV spectra have been obtained on the oils exuded from the two types of GE5601 silicone rubber. The infrared spectra were obtained using the PE 21 IR spectrophotometer^f. Approximately 10 ml of the chloroform extracts were evaporated onto disposable AgCl windows. The sample was run as a film between two plates. The UV spectra were run on the chloroform solutions using the PE 450 spectrophotometer^f with 1 cm quartz cells.

Spectra have been obtained on the oils collected under the following conditions:

1. chloroform extract of oil in unpressed rubber;
2. chloroform extract of oil collected on filter paper pressed with rubber for five days;
3. chloroform extract of oil collected on filter paper pressed with rubber for additional seven days;
4. chloroform extract of oil left in rubber after pressing for twelve days.

These spectra have been compared with those of DC200 and DC705^g.

It appears that the oil initially exuded is primarily a polydimethylsiloxane like DC200 with a small amount of polydiphenylsiloxane or polymethylphenylsiloxane. The relative amount of diphenylsiloxane increases after the second pressing. Studies are still in progress to determine the exact composition of the exuded oils.

ANALYSIS OF SILICONE OIL ON PETN

A 10 g sample of PETN was coated with 1 g of DC705 silicone oil. The oil was dissolved in 100 ml of hexane, the PETN added and then the hexane stripped off in a rotary evaporator. Three one gram samples of the coated PETN were analyzed for silicone oil. The oil was extracted from the PETN with hexane and the

^e A solvent for amine cured urethanes, silicone moldings and anhydride epoxies. Dynalog, Inc., Hanover, New Jersey.

^f Perkin-Elmer Corporation, Norwalk, Connecticut.

^g A Dow Corning polymethylphenylsiloxane.

solutions analyzed by liquid chromatography. The integrated area of the UV absorption peak of the eluted sample was compared with the peak areas of standard solutions of DC705 in hexane. The results were as follows:

1. $5.72 \pm 0.24\%$
2. $4.81 \pm 0.46\%$
3. $8.02 \pm 0.46\%$

The errors are adjusted for a 95% confidence level. The average for the three samples is 6.18% which is 3.82% lower than the 10% added. The 3.21% range for the three samples indicates inhomogeneous coating of the PETN.

Refinements in the coating method and analysis are being sought.

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