National Bureau of Standards

Report of Investigation

Research Material 8500a

A Catalyst Package for Lubricant Oxidation

Charles S. Ku and Patrick T. Pei

This Research Material (RM) is intended primarily for use in evaluating the oxidation stability of lubricating oils, i.e., automotive crankcase lubricants. It is analogous to Standard Reference Material (SRM) 1817 [1] except the testing program has been as extensive. RM 8500a consists of an oxidized/nitrated fuel fraction, a metal naphthenate mixture, and distilled naphthenes. The metal naphthenate mixture has the following weight percentage of metal naphthenes: lead-82, iron-7, copper-4, manganese-3.5, and tin-3.5.

RM 8500a was used to determine the oxidation stability of ASTM Sequence IID reference oils using the NBS-developed thin-film oxygen uptake test (TFOUT) [2]. The TFOUT procedure is currently proposed as an ASTM method [3]. Using the TFOUT test conditions for ASTM sequence reference oils, results using RM 8500a were compared to previous results using RM 1817. The results are given in Figure 1 and Table 1. As these data indicate, there is agreement between the results obtained with RM 8500a and SRM 1817.

Notice and Warnings to Users:

Expiration: This Report of Investigation should be considered valid, within the limits specified, for one year from the date of purchase.

Storage: Sealed ampoules, as received, should be stored in the dark at a temperature between 10°-25°C.

Use: Each ampoule should be shaken thoroughly before opening. Samples should be taken immediately after opening an ampoule, and should be used without delay for the certified values to be valid. Certified values are not valid for ampoules that have been opened and resealed.

Analytical and oxidation tests were performed in the Ceramics Division, Institute for Materials Science and Engineering, C.S. Ku and P.T. Pei.

The overall coordination leading to the certification of this RM was provided by R.G. Munro and S.M. Hsu.

The technical and support aspects involved in the preparation, analysis, and issuance of this Research Material were coordinated through the Office of Standard Reference Materials by R.L. McKenzie.

Laithburg, MD 20899

Date: 30, 1986

(over)
PREPARATION

Fuel Fraction

The fuel fraction was produced by the oxidation/nitration of a high boiling VD gasoline fraction (ASTM VD engine test fuel)[2]. The total acid number of the fuel fraction of RM 8500a was determined to be 2.3 ± 0.3 (ASTM D644).

Metal Naphthenates

The metal naphthenate mixture in RM 8500a is made of commercially available metal naphthenates according to the weight percentages described by Hotten and Kind [4]. The mixture is provided for user convenience and is the mixture used at NBS to generate the data in Table 1. Depending on the individual metal, and the particular batch, the metal content and the molecular weight distribution of each metal naphthenate may vary significantly. However, no significant effects on oxidation results caused by this variation have been observed at NBS.

The metal naphthenates in this RM have been carefully characterized and are from a single batch. During a one-year period, some precipitates may be observed in the metal mixture, but oxidation test repeatability has not been found to be affected by the presence of such precipitates.

References


