National Bureau of Standards

Report of Investigation

Research Material 8500a

A Catalyst Package for Lubricant Oxidation

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

:M 8500a was used to determine the oxidation stability of ASTM Sequence IIID reference oils using the NBS-developed
ıin-film oxygen uptake test (TFOUT) [2]. The TFOUT procedure is currently proposed as an ASTM method [3]. Using the
'FOUT 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
btained with RM 8500a and SRM 1817.

lotice and Warnings to Users:

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

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

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

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

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

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

aithersburg, MD 20899
ne 30, 1986

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

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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

1. Certificate of Analysis, Standard Reference Material 1817 - A Catalyst Package for Lubricant Oxidation. Office of Standard Reference Materials, National Bureau of Standards, Gaithersburg, MD 20899, May 1983.

2. Ku, C.S. and Hsu, S.M., "A Thin-Film Oxygen Uptake for the Evaluation of Automotive Crankcase Lubricants," Lubrication Engineering, 40, 2, pp. 75-83 (1984).

3. Working Document of ASTM Committee D-2 on Petroleum Products and Lubricants: Manuscript for ASTM Test Method for Oxidation Stability of Gasoline Automotive Engine Oils by Thin-Film Oxygen Uptake. (Currently, the document is in the process of Committee D-2 balloting for acceptance.)

4. Hotten, B.W. and King, I.M., "Lubricating Oil Additive Composition," U.S. Patent No. 4,032,462 (June 28, 1977).