S. Department of Commerce
Malcolm Baldrige
Secretary

National Bureau of Standards
Ernest Ambler, Director

National Bureau of Standards Certificate of Analysis

Standard Reference Materials 1083, 1084, and 1085

Wear-Metals in Lubricating Oil

These Standard Reference Materials (SRM's) are intended for use in the calibration of apparatus and in the evaluation of methods used in the analysis of engine lubricating oils for wear-metal content. They consist of a base oil, SRM 1083, and two blends of metallo-organic compounds in the base oil at nominal levels of 100 μg/g in SRM 1084, and 300 μg/g in SRM 1085.

SRM 1083 is not certified, but is issued as a diluent for SRM's 1084 and 1085. Information values listed for SRM 1083 are conservative upper limits of the elements detected.

The concentrations given in Table 1 are based on a minimum sample size of 0.5 g, which is the minimum amount to be used for analysis. When not in use, the material should be kept in the original bottle with the top tightly closed.

Table 1

SRM 1083			SRM 1084			SRM 1085		
Element	Information Value[1] (μg/g)	Methods	Certified Concentration[2] (μg/g)	Estimated Uncertainty (μg/g)	Methods	Certified Concentration[2] (μg/g)	Estimated Uncertainty (μg/g)	Methods
Al	(<0.5)	a	98	±2	a,d	296	± 4	a,d
Cr	(<0.02)	a,c	100	±3	a,b,c,d	298	± 5	a,b,c,d
Cu	(<0.5)	a	98	±4	a,b,c,d	295	±10	a,b,c,d
Fe	(<1)	a,c	*100*	±3	a,d	*300*	± 4	a,d
Pb	(<0.04)	a	(101)*	---	a,b,d	(305)*	---	a,b,d
Mg	(<0.1)	a	98	±4	a,d	297	± 3	a,d
Mo	(<0.01)	c	97	±5	b,c,d	292	±11	b,c,d
Ni	(<0.4)	a	101	±4	a,b,d	303	± 7	a,b,d
Si	(<1)	a	(102)	---	d,f	(308)	---	d,f
Ag	(<0.05)	a	(101)	---	b,c,d	(291)	---	b,c,d
S	(980)	e	(2237)	---	e	(4806)	---	e
Sn	(<0.4)	a	102	±6	c,d,f	296	±12	c,d,f
Ti	(<5)	a	99	±5	a,d	300	± 4	a,d
V	(<0.3)	f	(<0.3)	---	f	(<0.3)	---	f

a) Atomic Absorption and Flame Emission Spectrometry
b) Isotope Dilution Spark Source Mass Spectrometry
c) Instrumental Neutron Activation Analysis
d) Inductively Coupled Plasma Emission Spectroscopy
e) Ion Chromatography
f) Direct Current Plasma Emission Spectroscopy

[1]Values in parentheses are informational values only; they are *not certified.* For most elements, these values are based on measurements by a single technique or method.

[2]The certified values and estimated uncertainties constitute a summary of the range covered by the 95% confidence intervals computed separately for the data from each analytical method.

*Lead is not certified, as it is not stable once the bottle has been opened. See "Stability" on page 2.

The overall direction and coordination of the analytical measurements leading to certification were performed under the chairmanship of E.L. Garner, Chief, NBS Inorganic Analytical Research Division.

The technical and support aspects involved in the preparation, certification, and issuance of these Standard Reference Materials were coordinated through the Office of Standard Reference Materials by R.W. Seward.

Gaithersburg, MD 20899
July 29, 1985
(Revision of Certificate dated August 2, 1982.)

This revision lists information values for SRM 1083.

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

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Preparation

The preparation of SRM's 1084 and 1085 was performed under contract from NBS by the Conostan Division of Conoco Inc., Ponca City, Oklahoma, under the direction of W.L. Groves. Twelve Conostan metallo-organic compounds were blended with Conostan Base Oil 245 to form two blends of 45 kg each, with nominal concentrations of 100 and 300 $\mu g/g$, respectively. Stabilizers were added to the two blends.

Stability

Stability tests were conducted on two similar blends prepared at NBS from Conostan Base Oil 245 and Conostan metallo-organic compounds. Analyses after seven years of storage under normal laboratory conditions indicated excellent stability. (NOTE: For lead, the concentration appears to be stable in unopened bottles; however, after the contents have been exposed to air, the lead concentration slowly decreases. Therefore, lead is not certified.) Base Oil 245 was used in the new blends rather than conduct stability tests on newer base oils. Because this base oil is no longer commercially available, SRM 1083 is being issued for use as a diluent with SRM's 1084 and 1085. SRM's 1084 and 1085 were blended and bottled in 1979. Analytical data obtained over a five-year period on these blends showed no indication of material instability (except for lead). However, periodic stability tests will be conducted at NBS and any substantive change will be reported to purchasers.

Additional Information on SRM 1083, Base Oil

Although these elements were not added to SRM's 1084 and 1085, the concentrations in the base oil (SRM 1083) were determined by Instrumental Neutron Activation Analysis, and are provided for information only.

Element	Value ($\mu g/g$)
Cd	(<0.04)
Cl	(1.7)
Co	(<0.01)
Mn	(<0.005)
Na	(<0.06)
Zn	(<0.08)

Testing and Analysis

Each SRM was bottled at NBS and numbered sequentially. K.R. Eberhardt of the Statistical Engineering Division designed the statistical sampling scheme for selecting 25 bottles from each SRM for both certification and stability testing.

Analyses were performed in the NBS Inorganic Analytical Research Division.

Atomic Absorption and Emission Spectroscopy: T.C. Rains, M.S. Epstein, T.A. Rush, T.A. Butler, and D. Mo.

Isotope Dilution Spark Source Mass Spectrometry: P.J. Paulsen, W.R. Kelly, and G.M. Lambert.

Neutron Activation Analysis: R. Zeisler and R.F. Fleming.

Inductively Coupled Plasma: R.L. Watters, Jr., and Y.K. Zhang.

Ion Chromatography: W.F. Koch and R.M. Stone.

Direct Current Plasma: M.S. Epstein.