



Certificate of Analysis

Standard Reference Material[®] 2299

Sulfur in Gasoline (Reformulated)

This Standard Reference Material (SRM) is a commercial reformulated unleaded motor gasoline intended for use in the evaluation of methods and the calibration of instruments used in the determination of total sulfur in gasoline or materials of similar matrix. A unit of SRM 2299 consists of 5 amber ampoules, each containing approximately 20 mL of gasoline.

Certified Value: A NIST certified value is a value for which NIST has the highest confidence in its accuracy in that all known or suspected sources of bias have been investigated or taken into account [1]. The certified sulfur content provided in Table 1 is based on analyses by isotope dilution thermal ionization mass spectrometry (ID-TIMS) [2]. Homogeneity testing was performed using X-ray fluorescence spectrometry. The uncertainty in the certified value is expressed as an expanded uncertainty and is calculated according to the ISO/JCGM Guide [3] with coverage factor, $k = 2$, for a 95 % confidence interval.

Table 1. Certified Mass Fraction Value^(a)

Sulfur (S): 13.6 $\mu\text{g/g}$ \pm 1.5 $\mu\text{g/g}$

^(a) The measurand is the total concentration of sulfur in gasoline and the certified value is metrologically traceable to the unit microgram of sulfur per gram.

Information Value: An information value is considered to be a value that will be of interest to the SRM user, but insufficient information is available to assess the uncertainty associated with the value or only a limited number of analyses were performed [3]. An information value for density is provided in Table 2.

Expiration of Certification: The certification of **SRM 2299** is valid, within the measurement uncertainty specified, until **31 December 2021**, provided the SRM is handled and stored in accordance with instructions given in this certificate (see "Instructions for Handling, Storage, and Use"). This certification is nullified if the SRM is damaged, contaminated, or otherwise modified.

Maintenance of SRM Certification: NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet or register online) will facilitate this notification.

Coordination of the technical measurements leading to certification of this SRM were performed by J.D. Fassett of the NIST Materials Measurement Science Division.

Analytical measurements were performed by W.R. Kelly, J.L. Mann, A.F. Marlow, J.R. Sieber, and R.D. Vocke of the NIST Chemical Sciences Division.

Statistical consultation for this SRM was provided by W.F. Guthrie of the NIST Statistical Engineering Division.

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Steven J. Choquette, Director
Office of Reference Materials

The gasoline for this SRM was provided by the ExxonMobil Company⁽¹⁾ (Fairfax, VA).

Support aspects involved in the issuance of this SRM were coordinated through the NIST Office of Reference Materials.

INSTRUCTIONS FOR HANDLING, STORAGE, AND USE

Each SRM ampoule should only be opened for the minimum time required to dispense the material. Once an ampoule is opened, the material must be used within a period of five hours to avoid a significant change in the sulfur content. To relate analytical determinations to the certified value in this certificate, a minimum sample mass of 150 mg should be used. The unopened ampoules should be stored under normal laboratory conditions away from direct sunlight.

Table 2. Information Value

Physical Property Test ^(a)	ASTM Standard Used	Result
Density @ 15 °C	D 4052-96	728.9 kg/m ³

^(a) This property was determined by a commercial firm using ASTM methods. The result is **NOT** certified and is provided as additional information on the matrix.

REFERENCES

- [1] May, W.; Parris, R.; Beck, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definitions of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements*; NIST Special Publication 260–136, U.S. Government Printing Office: Washington, DC (2000); available at <http://www.nist.gov/srm/upload/SP260-136.PDF> (accessed Feb 2017).
- [2] Kelly, W.R.; Paulsen, P.J.; Murphy, K.E.; Vocke, R.D., Jr.; Chen, L.-T.; *Determination of Sulfur in Fossil Fuels by Isotope Dilution Thermal Ionization Mass Spectrometry*; Anal. Chem., Vol. 66, pp. 2505–2513 (1994).
- [3] JCGM 100:2008; *Evaluation of Measurement Data - Guide to the Expression of Uncertainty in Measurement*; (GUM 1995 with Minor Corrections), Joint Committee for Guides in Metrology (2008); available at http://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Feb 2017); see also Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297; U.S. Government Printing Office: Washington, DC (1994); available at <http://www.nist.gov/pml/pubs/index.cfm> (accessed Feb 2017).

Certificate Revision History: 10 February 2017 (Change of expiration date; editorial changes); 06 November 2013 (Extension of certification period; editorial changes); 01 October 2009 (This revision adds an information value for density); 15 February 2008 (Extension of certification period); 30 October 2002 (Original certificate date).
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Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 948-3730; e-mail srminfo@nist.gov; or via the Internet at <http://www.nist.gov/srm>.

⁽¹⁾Certain commercial instruments, materials, or processes are identified in this certificate to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the instruments, materials, or processes identified are necessarily the best available for the purpose.