



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material[®] 2886

Polyethylene

(Mass-Average Molar Mass [M_w] 87 000 g/mol)

This Standard Reference Material (SRM) is intended primarily for use in calibration and performance evaluation of instruments used to determine the molar mass, previously expressed as molecular weight [1], and molar mass distribution by size exclusion chromatography. A unit of SRM 2886 consists of approximately 0.3 g of polyethylene powder.

Certified Values and Uncertainty: The certified value for M_w was measured using static light scattering with 1-chloronaphthalene as the solvent at 130 °C [2]. The certified value for the intrinsic viscosity was determined in 1,2,4-trichlorobenzene (TCB) at 130 °C. The certified values and uncertainties for mass-average molar mass and intrinsic viscosity are presented in Table 1.

Table 1. Certified Properties

Property	Certified Value
Mass-Average Molar Mass (M_w)	$87.0 \times 10^3 \text{ g/mol} \pm 6.0 \times 10^3 \text{ g/mol}$
Intrinsic Viscosity [η]	$157.8 \text{ mL/g} \pm 2.1 \text{ mL/g}$

The certified measurement uncertainty is expressed as a combined expanded uncertainty with a coverage factor, $k = 2$, calculated in accordance with NIST procedure [3]. Type A and Type B contributions to the expanded uncertainty of the measured mass-average molar mass include the uncertainties in the Rayleigh ratio of the scattering standard, optical alignment, and calibration of the differential refractometer. The measurands are mass average molar mass and intrinsic viscosity. The certified value are metrologically traceable to the SI unit of mass expressed as grams per mol, and to the SI unit of viscosity expressed as milliliters per gram; respectively.

Expiration of Certification: The certification of **SRM 2886** is valid, within the measurement uncertainty specified, until **01 June 2020**, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Storage"). 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 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 notification.

Technical coordination leading to certification of this SRM was provided by B.M. Fanconi of the NIST Materials Science and Engineering Division. Technical measurements and data interpretation were provided by C.M. Guttman, of the NIST Materials Science and Engineering, and J.R. Maurey, and W.R. Blair formerly of the NIST Polymers Division.

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

John E. Bonevich, Acting Chief
Materials Science and Engineering Division

Gaithersburg, MD 20899
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Certificate Revision History on Last Page
SRM 2886

Steven J. Choquette, Director
Office of Reference Materials

INSTRUCTIONS FOR STORAGE

The SRM should be stored in the original bottle with the lid tightly closed under normal laboratory conditions.

Homogeneity and Characterization: The homogeneity of SRM 2886 was tested by size exclusion chromatography analysis of solutions in 1,2,4-trichlorobenzene at 130 °C. The characterization of this polymer is described in reference 2. SRM 2886 is the result of a clean-up, blending, and rebottling of the fractionation of SRM 1475. It was produced in the same fractionation as SRM 1482, SRM 1483, and SRM 1484 [4].

REFERENCES

- [1] Thompson, A.; Taylor, B.N.; *Guide for the Use of the International System of Units (SI)*; NIST Special Publication 811 (2008); available at: <https://physics.nist.gov/cuu/pdf/sp811.pdf> (accessed Jun 2018).
- [2] Guttman, C.M.; Maurey, J.R.; Blair, W.R.; *Certification of the Relative Molecular Mass and the Limiting Viscosity of SRM 2886, a Polyethylene of Narrow Molecular Mass Distribution*; NISTIR 6487.
- [3] JCGM 100:2008; *Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement* (ISO GUM 1995 with Minor Corrections); Joint Committee for Guides in Metrology (JCGM) (2008); available at https://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Jun 2018); 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 <https://www.nist.gov/pml/pubs/tn1297/index.cfm> (accessed Jun 2018).
- [4] Verdier, P.H.; Wagner, H.L.; *The Characterization of Linear Polyethylene SRM's 1482, 1483, and 1484, I. Introduction*; NBS Special Publication 260–61; or National Bureau of Standards, Journal of Research, Vol. 83, No. 2, pp. 169–171 (1978).

Certificate Revision History: 07 June 2018 (Title update; editorial changes); 19 January 2018 (Title update; editorial changes); 24 July 2015 (Change of expiration date editorial changes); 29 November 2007 (Update of certification period); 06 April 2001 (original certificate date).

Users of this SRM should ensure that the certificate 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 <https://www.nist.gov/srm>.