



Certificate of Analysis

Standard Reference Material[®] 1474a

Polyethylene Resin

This Standard Reference Material (SRM) is intended for use in calibration and performance evaluation of instruments used in polymer technology and science for the determination of the Melt Flow Rate using ASTM D1238-00, Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer [1] Standard Test Condition 190/2.16. A unit of SRM 1474a consists of approximately 60 g of white polyethylene pellets in an amber glass bottle.

Certified Values and Uncertainties: This material is certified for Melt Flow Rate using ASTM D1238-00 [1]. The flow rate of the melt was determined at $190.0\text{ °C} \pm 0.1\text{ °C}$ and a load of 2.16 kg by procedure A of the ASTM method. A manually operated extrusion plastometer was used. Under these conditions [2], the certified melt flow rate for this material is as follows:

$$\text{Melt Flow Rate (FR)} = 5.10\text{ g/10 min} \pm 0.42\text{ g/10 min}$$

The uncertainty is an expanded uncertainty $U = ku_c$ with U determined from a combined standard uncertainty, u_c and coverage factor $k = 2$ [3] with a level of confidence of approximately 95 %. Type A and Type B contributions to the expanded uncertainty include the standard deviation of the melt flow measurements, instrument-to-instrument variation as discussed in ASTM D1238-00 [1], operator dependence of the measurement, and temperature gradients in the apparatus [2]. The standard deviation for single measurement is 0.056 g/10 min, with 44 degrees of freedom [2].

Expiration of Certification: The certification of **SRM 1474a** is valid, within the measurement uncertainty specified, until **01 January 2019**, 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 technical changes occur that affect the certification before the expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

The technical coordination leading to certification of this SRM was provided by B.M. Fanconi formerly of the NIST Polymers Division.

The technical measurement and data interpretation were provided by K.M. Flynn and C.M. Guttman of the NIST Materials Science and Engineering Division and J.R. Maurey formerly of the NIST Polymers Division.

Statistical analysis was provided by S.D. Leigh of the NIST Statistical Engineering Division.

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

Eric K. Lin, Chief
Materials Science and Engineering Division

INSTRUCTIONS FOR STORAGE

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

Homogeneity: The homogeneity of SRM 1474a was tested by melt flow rate measurements using ASTM D1238-00 [1]. The characterization of this polymer is described in reference 2.

REFERENCES

- [1] ASTM D1238-00; *Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer*; Annu. Book ASTM Stand., Vol. 08.01 (2001).
- [2] Maurey, J.R.; Schultheisz, C.; Blair, W.R.; Guttman, C.M.; *Certification of Standard Reference Material 1474a, A Polyethylene Resin*; NIST Special Publication SP 260-148; National Institute of Standards and Technology, U.S. Department of Commerce: Gaithersburg, MD (2003); available at <http://www.nist.gov/srm/publications.cfm> (accessed Jan 2014).
- [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 (JCGM) (2008); available at http://www.bipm.org/utis/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Jan 2014); 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 Jan 2014).

Certificate Revision History: 21 January 2014 (Corrected equation for expanded uncertainty; editorial changes) 28 September 2011 (Extension of certification period; editorial changes); 29 November 2007 (Extension of certification period); 18 March 2003 (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>.