National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material® 2571

Lead Paint Film for Building Surfaces
(Nominal Pb 3.5 mg/cm^2) (Color: Yellow)

This Standard Reference Material (SRM) is intended for validation of results from portable, hand-held, X-ray fluorescence analyzers, when testing for lead in paint coatings on interior and exterior building surfaces. A unit of SRM 2571 consists of a white polyester sheet, approximately 7.6 cm wide, 10.2 cm long, and 0.2 mm thick, coated with a single, yellow-colored paint layer, approximately 0.04 mm thick. Included is one unit of SRM 2570, which is coated with a lead-free, lacquer layer of the same thickness as a lead paint layer and is intended as a blank. All sheets are over coated with a clear, thin, plastic laminate to protect the surface from abrasion.

Certified Values: The measurand is the total lead areic mass in cured paint for each level listed below [1]. 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 [2]. Value assignment categories are based on the definitions of terms and modes used at NIST for certification of chemical reference materials [2]. The certified value is based on measurements by isotope dilution inductively coupled plasma mass spectrometry (ID-ICP-MS).

Level	Color	Lead Areic Mass (mg/cm^2)
SRM 2570	White (blank)	< 0.001
SRM 2571	Yellow	3.58 ± 0.39

The uncertainty associated with each certified value is an expanded uncertainty, U, and was evaluated in accordance with the ISO/JCGM Guides [3,4]. Because of variability in the paint film between different sheets of each SRM, the uncertainties are 95 % prediction intervals. The expanded uncertainty is calculated as $U = ku_c$, where u_c is intended to represent, at the level of one standard deviation, the combined uncertainty due to material variability and measurement uncertainty. The coverage factor, k, is determined from the Student's t-distribution corresponding to the calculated effective degrees of freedom and 95 % level of confidence. Metrological traceability is to the SI units for mass and length (expressed as milligrams per centimeter-squared).

Expiration of Certification: The certification of **SRM 2571** is valid, within the measurement uncertainty specified, until **01 July 2026**, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Instructions for Use"). The 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) will facilitate notification.

Coordination of technical measurements for the certification of this SRM was performed by G.C. Turk and J.D. Fassett of the NIST Chemical Sciences Division.

Measurements for value assignments of this SRM were performed by K.E. Murphy, J.R. Sieber, A.F. Marlow, L.J. Wood, P.R. Seo, and M. Lankosz of the NIST Chemical Sciences Division.

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Steven J. Choquette, Acting Director
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Statistical consultation for this SRM was provided by E.S. Lagergren and N.F. Zhang of the NIST Statistical Engineering Division.

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

INSTRUCTIONS FOR USE

The SRM sheet must first be removed from the plastic sleeve in which it is stored. Position the sheet so that the side labeled with the NIST logo and SRM number faces the X-ray source. Additional layers of material placed between the sheet and the measurement instrument may bias the measurements by absorbing radiation impinging on the sheet and fluorescent X-rays emanating from lead in the paint. For best results, the X-ray beam should irradiate an area of the SRM that is at least 2.5 cm in diameter and is centered on the sheet. Care must be exercised not to compromise the protective plastic laminate that prevents scratching or chipping of the painted surface and the potential release of dust containing lead (See "Preparation and Analysis"). Upon completion of the measurement, store the SRM in the plastic sleeve provided. It is also recommended that this SRM be stored indoors at ambient room temperature and away from direct sunlight when not in use.

WARNING TO USERS

WARNING: SRM 2571 is a manufactured item containing lead as lead chromate, which is toxic and a suspected carcinogen to the lungs and kidneys. Under normal conditions of use, this SRM does not release this hazardous chemical. SRM 2571 must be handled with care and disposed of according to the U.S. Environmental Protection Agency (EPA) practices and procedures. No lead was intentionally added to SRM 2570.

PREPARATION AND ANALYSIS

The paint-coated, polyester sheets were prepared by an automated coating process at a commercial facility under contract to NIST. Known concentrations of lead chromate were dispersed in a commercial paint vehicle to prepare the lead paints. A lead-free, organic tint was added to each paint mixture to give the desired color. A thin, protective overlay of plastic laminate was applied to each paint film. The paint layer and white polyester sheet are approximately 0.04 mm and 0.2 mm thick, respectively. For SRM 2570, the paint was replaced by a lead-free lacquer of the same thickness. The attenuation of lead L_3-$M_{4,5}$ ($L\alpha_{1,2}$) X-rays due to the protective overlay does not exceed 2 % relative, while attenuation of K-$L_{2,3}$ ($K\alpha_{1,2}$) X-rays is negligible.

REFERENCES

[1] Thompson, A.; Taylor, B.N.; *Guide for the Use of the International System of Units (SI)*; NIST Special Publication 811; U.S. Government Printing Office: Washington, DC (2008); available at www.nist.gov/pml/pubs/index.cfm/ (accessed Mar 2016).

[2] 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 www.nist.gov/srm/publications.cfm (accessed Mar 2016).

[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/utils/common/documents/jcgm/JCGM_100_2008_E.pdf (accessed Mar 2016); 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 Mar 2016).

[4] Hahn, G.J.; Meeker, W.Q.; *Statistical Intervals: A Guide for Practitioners*; John Wiley & Sons, Inc., New York, NY (1991).

Certificate Revision History: 14 April 2016 (Change of expiration date; editorial changes); 24 March 2009 (Extension of certification period); 29 November 1999 (Original certificate date).

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.