



# National Institute of Standards & Technology

## Certificate of Analysis

### Standard Reference Material<sup>®</sup> 2579a

#### Lead Paint Films For Portable X-Ray Fluorescence Analyzers (SRM 2570 – SRM 2575)

This Standard Reference Material (SRM) is intended for checking the calibration of portable, hand-held, x-ray fluorescence analyzers when testing for lead in paint coatings on interior and exterior building surfaces. A unit of SRM 2579a consists of a set of six coated polyester sheets, approximately 7.6 cm wide and 10.2 cm long. Five of the six sheets, SRM 2571 to SRM 2575, are coated with a single, uniform paint layer. The units are color coded and each color indicates a different level of lead content. The paint layer and white polyester sheet are approximately 0.04 mm and 0.2 mm thick, respectively. The sixth sheet, SRM 2570, is coated with a lead-free, lacquer layer of the same thickness as the lead paint samples and is included as a blank. All sheets are over-coated with a clear, thin, plastic laminate to protect the surface from abrasion.

The certified values for lead for this SRM are reported in Table 1 in units of mg/cm<sup>2</sup>. These values are based on measurements by isotope dilution inductively-coupled plasma mass spectrometry.

Table 1. Certified Lead Values

Level	Color Code	Lead Concentration, in mg/cm <sup>2</sup>
SRM 2570	White (blank)	<0.001
SRM 2571	Yellow	3.58 ± 0.39
SRM 2572	Orange	1.527 ± 0.091
SRM 2573	Red	1.040 ± 0.064
SRM 2574	Gold	0.714 ± 0.083
SRM 2575	Green	0.307 ± 0.021

The uncertainty of each certified value is expressed as an expanded uncertainty,  $U$ , at the 95 % level of confidence and is calculated according to the method described in the ISO Guide [1,2]. 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.

**Expiration of Certification:** The certification of SRM 2579a is valid, within the measurement uncertainties specified, until **01 July 2020**, 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.

The overall direction and coordination of the analytical measurements leading to certification were performed by G.C. Turk and J.D. Fassett of the NIST Analytical Chemistry Division. Analytical measurements were performed by K.E. Murphy, J.R. Sieber, A.F. Marlow, L.J. Wood, P.R. Seo, and M. Lankosz of the NIST Analytical Chemistry Division. Each SRM was fabricated under the direction of J.R. Sieber of the NIST Analytical Chemistry Division.

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Analytical Chemistry Division

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Gaithersburg, MD 20899  
Certificate Issue Date: 24 March 2009  
*See Certificate Revision History on Last Page*

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 Measurement Services Division.

**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.

## NOTICE AND WARNING TO USERS

**NOTE:** This SRM contains lead as a lead chromate pigment, which is toxic and a suspected carcinogen to the lung and kidney. It must be handled with care and disposed of according to the U.S. Environmental Protection Agency (EPA) practices and procedures.

## INSTRUCTIONS FOR USE

The SRM sheet must first be removed from the plastic sleeve in which it is stored and then positioned so that the side labeled with the NIST logo and SRM number faces the x-ray source. For best results, the size of the x-ray beam from the field unit 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 which prevents scratching or chipping of the painted surface and the potential release of dust containing lead. Upon completion of the measurement, the SRM must be re-stored 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.

## PREPARATION

**SRM Preparation:** The paint-coated, polyester sheets were prepared by an automated coating process at a commercial facility under contract to NIST. Known concentrations of a lead chromate pigment 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 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 that of K- $L_{2,3}$  ( $K\alpha_{1,2}$ ) x-rays commonly used for field measurement is negligible.

## REFERENCES

- [1] ISO; *Guide to the Expression of Uncertainty in Measurement*; ISBN 92-67-10188-9, 1st ed., International Organization for Standardization: Geneva, Switzerland (1993); 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://physics.nist.gov/Pubs/>.
- [2] Hahn, G.J.; Meeker, W.Q.; *Statistical Intervals: A Guide for Practitioners*; John Wiley & Sons, Inc., New York, NY (1991).

**Certificate Revision History:** 24 March 2009 (Extension of certification period); 29 November 1999 (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 at: telephone (301) 975-2200; fax (301) 926-4751; e-mail [srminfo@nist.gov](mailto:srminfo@nist.gov); or via the Internet at <http://www.nist.gov/srm>.*