National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 2579

Lead Paint Film on Mylar Sheet for Portable X-ray Fluorescence Analyzers

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.

SRM 2579 consists of a set of five 7.62 x 10.16 cm (3 in x 4 in) mylar sheets, four of which are coated with a single, uniform paint layer. Each paint layer has a different lead content which is color coded. The paint layer and the mylar sheet are 0.04 mm and 0.2 mm thick respectively. The fifth sheet is coated with a lead-free lacquer layer on mylar sheet of the same thickness as the lead paint samples and is included as a blank. All sheets are overcoated with a clear thin plastic laminate to protect the paint or lacquer layer from abrasion.

The certified values for lead for each level on the paint sheets are given in Table 1 in units of mg/cm^2. These values are based on measurements by isotope-dilution thermal ionization mass spectrometry and X-ray fluorescence spectrometry.

NOTICE AND WARNINGS TO USERS

Use: Proper use of this SRM requires that the color-coded side face the X-ray source. The blank level SRM has a clear glossy transparent side which should face 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 which is at least 2.5 cm in diameter, and is centered on the sheet.

Handling: 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 United States Environmental Protection Agency practices and procedures.

Storage: This SRM must be stored in the container provided at all times when not in use in the field. It is also recommended that this SRM be stored indoors at ambient room temperature when not in use in the field.

Expiration of Certification: The certified values are valid within the specified uncertainty limits for two years from the date of purchase. NIST will periodically monitor the SRM and in the event that the certification values become invalid, purchasers will be notified by NIST.

Financial support for this SRM was provided by the U.S. Department of Housing and Urban Development, Office of Lead Based Paint Abatement and Poisoning Prevention, R.J. Morony, contract manager.

The fabrication of the SRM was under the direction of M. McKnight of the NIST Building Materials Division. The coordination of the technical measurements for its certification was accomplished under the direction of P.A. Pella and J.R. DeVoe, of the NIST Inorganic Analytical Research Division.

Gaithersburg, MD 20899
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(Revision of certificate dated 10-10-92)

William P. Reed, Chief
Standard Reference Materials Program

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Statistical design and evaluation of the experimental data were performed by S.B. Schiller and E.S. Lagergren of the NIST Statistical Engineering Division.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.S. Kane.

Preparation: The paint layers on mylar sheet were prepared by an automated coating process by Munsell Color, Newburgh, New York. Known concentrations of a lead chromate pigment (United Technologies/Inmont) were dispersed in a commercial paint vehicle to prepare the lead paints. The nominal concentration in weight percent of lead in the paints used to prepare the various levels was: Level I (18%); Level II (10%); Level III (6%); and Level IV (2%). A lead-free organic tint was added by Munsell to each paint mixture to give the desired color. The thin protective overlay of the paint layers including the NIST SRM label was applied by Dickard Widder Industries, Maspeth, NY.

Homogeneity: The non-uniformity of the lead layer both across the width and along the length of the material was characterized with laboratory X-ray fluorescence spectrometry using the lead Lα X-ray line. The non-uniformity measured is the largest contributor to the analytical uncertainty given in Table 1. The attenuation of the lead Lα x-rays used for homogeneity testing due to the protective overlay does not exceed 2% relative, while that of the K x-rays commonly used for field measurement is negligible.

Table 1

Certified Values

Level	Color Code	Lead Concentration, mg/cm^2	[1] Estimated Uncertainty, mg/cm^2
I	Yellow	3.53	0.24
II	Orange	1.63	0.08
III	Red	1.02	0.04
IV	Green	0.29	0.01
Blank	Clear	<0.0001	

[1] The uncertainty includes both random and systematic components. The systematic component accounts for the variation in mean lead concentration over the width of the paint film. The random component is a distribution-free 95% confidence, 95% tolerance interval on the residuals after removal of the systematic trend. In the absence of systematic error, this interval will contain 95% of the true lead concentrations with 95% confidence.

Isotopic Composition: The isotopic composition in atom percent of the lead in the SRM is: ^{208}Pb 51.61%, ^{207}Pb 20.80%, ^{206}Pb 26.27%, ^{204}Pb 1.32%. The uncertainty for the ^{208}Pb, ^{207}Pb and ^{206}Pb isotopic abundance is estimated at 0.05% relative, while the uncertainty for the ^{204} lead Pb is 0.15% relative. These uncertainty estimates are 95% confidence intervals plus an allowance for systematic uncertainty. The atomic weight of the lead in the pigment is therefore 207.1901. The isotopic composition and atomic weight values are not certified, but are given for information only.

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