

July 2013

Editor: Regina R. Montgomery

## New and Renewal NIST SRMs/RMs

### NIST SRM 3667 Creatinine in Frozen Human Urine

The NIST Chemical Sciences Division has recently introduced SRM 3667 Creatinine in Frozen Human Urine. This SRM contains a single, healthy level of endogenous creatinine in urine. Creatinine levels in urine are of clinical interest because they are indicative of kidney function, are used to detect adulteration of urine specimens in drugs-of-abuse testing, and are a normalizing factor for comparing urine samples in environmental exposure and toxicological studies. The availability of this SRM will allow laboratories to evaluate the accuracy of their measurement methods as well as to objectively compare results from multiple analytical methods and clinical laboratories. SRM 3667 Creatinine in Frozen Human Urine is a human urine pool collected from healthy individuals, which contains an endogenous level of creatinine ( $61.8 \text{ mg/dL} \pm 1.3 \text{ mg/dL}$ ). This is NIST's first urine-based SRM with a value assigned for creatinine, which complements the existing clinical SRM selection. NIST currently offers SRM 914a Creatinine as well as SRM 909c Human Serum and SRM 967a Creatinine in Frozen Human Serum, which possess assigned values for creatinine. See Table 105.1 Chemical Laboratory Materials.



*Technical contact: Johanna Camara  
Email: [johanna.camara@nist.gov](mailto:johanna.camara@nist.gov)*

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**IMPORTANT  
MESSAGE ABOUT  
ACCESSING THE  
SRM WEBSITE**

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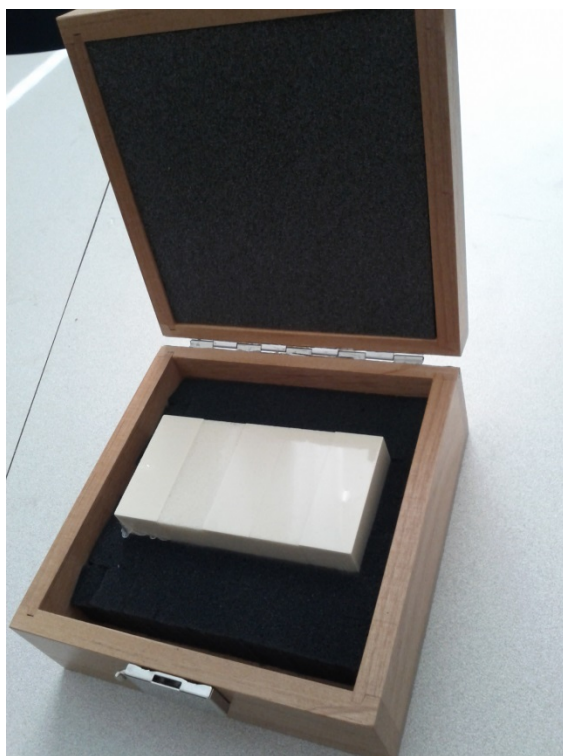
## NIST SRM 2088 Density Standard for Medical Computed Tomography

This Standard Reference Material is intended primarily to calibrate the medical computed tomography (CT) instruments for the densities in the range of lung tissue. It could equally be used for calibration in two-dimensional radiography. The SRM is a companion to SRM 2087 Length Standard for Medical Computed Tomography.

SRM 2088 consists of five densities of rigid polyurethane foam, spanning the range of  $60 \text{ kg/m}^3$  to  $300 \text{ kg/m}^3$ , which is centered on the average lung density of  $150 \text{ kg/m}^3$ . (The density of water in these units is  $1000 \text{ kg/m}^3$ .) The foam is certified both for physical density and for its mass absorption coefficient for four NIST standard x-ray beam qualities, representing tungsten tube voltages in the range of 80 kV to 150 kV.

Information values are provided using Hounsfield units (HU), which are widely used in medical CT. (The information values are not traceable to the International System of Units (SI) and uncertainties are not provided; however, these values may be of interest to the user).

Emphysema, a disease of the lung affecting some 2 percent of the adult U.S. population, is sometimes diagnosed by determining the fraction of lung tissue below a given Hounsfield unit value, a proxy for density. The SRM can be used for calibrating a CT machine in terms of the mass density in the lung region, establishing an SI-traceable link to a physical density of a standard reference.



*Technical Contact: Zachary Levine  
Email: Zachary.levine@nist.gov*

## NIST SRM 2374 DNA Sequence Library for External RNA Controls



NIST has issued a new Standard Reference Material<sup>®</sup> intended to underpin confidence in “genome-wide” gene expression measurements. This reference material is a library of DNA templates used to make RNA controls. The RNA controls are then used to assess the technical performance of a gene expression experiment. The certified properties of this new reference material are the sequences of the 86 319 bases of DNA contained in the templates, each with a confidence estimate. This is the first such reference material from NIST in which the certified properties are so-called “nominal” properties (A, C, G, T nucleotide sequences). Because certified properties need some sort of estimate of uncertainty (usually a numeric range about the certified value), a new scale was developed to express confidence in the sequence calls (“Most Confident,” “Very Confident,” “Confident,” and “Ambiguous”).

### Why Gene Expression?

The genome of an organism (its complete genetic code, stored in DNA molecules) is essentially constant in all of its cells over its lifetime. The genes that are “expressed,” or made functional as RNA molecules, give rise to the varying biological activity of those cells over time. A caterpillar that metamorphoses into a butterfly doesn’t change its genome; its changes arise from changes in gene expression. Measuring the abundances of the full cohort of expressed genes (the genome-wide gene expression profile) is used as a molecular measure of biological state.

Early gene expression measurements were thrilling in their potential to reveal biological activity but mystifying for their irreconcilable and irreproducible results. Industry turned to NIST for answers because measurement artifacts and problems were responsible for the irreproducibilities. NIST convened the interested parties and began hosting the External RNA Control Consortium (ERCC): an international consortium of more than 100 organizations from the public, private, and academic sectors. Working with the consortium, NIST developed the DNA sequence library SRM and established analytical methods to bring gene expression measurements into routine high-quality practice.

In practice, RNA controls derived from SRM 2374 (usually referred to as “ERCC Controls”) are added to the samples being studied, and assay precision and accuracy are evaluated based on the known amounts and ratios of the controls added.

ERCC Controls are now available from two commercial sources, and one gene expression assay technology includes ERCC controls built in to every assay kit they sell. Many DNA microarray products have been revised to measure the ERCC controls, and commercial RNA-Sequencing protocols recommend their use. The broad adoption of these controls is one reason that gene expression assays have become a routinely reliable insight into the molecular signatures of biological activity.

*Technical Contact: Marc Salit*  
*Email: marc.salit@nist.gov*

## NIST SRM 1991 Mixed Coal Tar/Petroleum Extract in Methylene Chloride

Following the release of crude oil from the Deepwater Horizon (DWH) site in the Gulf of Mexico, there was renewed interest in quantifying the analytes associated with crude oil. One of the complications in quantifying total polycyclic aromatic hydrocarbons (PAHs) is measurement of the alkylated PAHs. Because few alkylated PAHs are available as pure standards, their response factors for quantification are typically estimated rather than measured; the instrumental response of the alkylated isomers, however, varies. To provide a common calibration solution for quantifying alkyl PAHs, NIST has collaborated with the Energy and Environmental Research Center (EERC) at the University of North Dakota to prepare a dichloromethane solution of a mixed coal tar and petroleum-based sample containing the entire range of alkyl clusters and parent PAHs, SRM 1991. The mixed coal tar/petroleum non-aqueous phase liquid (NAPL) used for this SRM was received from EERC. A known mass of the mixed coal tar/petroleum sample was diluted with a known mass of methylene chloride, stirred overnight, and ampouled under an argon headspace. Each 2-mL amber ampoule contains approximately 1.2 mL of the methylene chloride solution. SRM 1991 is intended for use in evaluating analytical methods for the determination of PAHs, particularly in determining relative response factors for ASTM Method D7363-11 “Standard Test Method for Determination of Parent and Alkyl Polycyclic Aromatics in Sediment Pore Water Using Solid-Phase Microextraction and Gas Chromatography/Mass Spectrometry in Selected Ion Monitoring Mode” [1].



- [1] ASTM Method D7363-11; *Standard Test Method for Determination of Parent and Alkyl Polycyclic Aromatics in Sediment Pore Water Using Solid-Phase Microextraction and Gas Chromatography/Mass Spectrometry in Selected Ion Monitoring Mode*; ASTM Committee D19, Subcommittee D19.06 (2011).

Technical Contact: Jacolin Murray  
Email: [jacolin.murray@nist.gov](mailto:jacolin.murray@nist.gov)



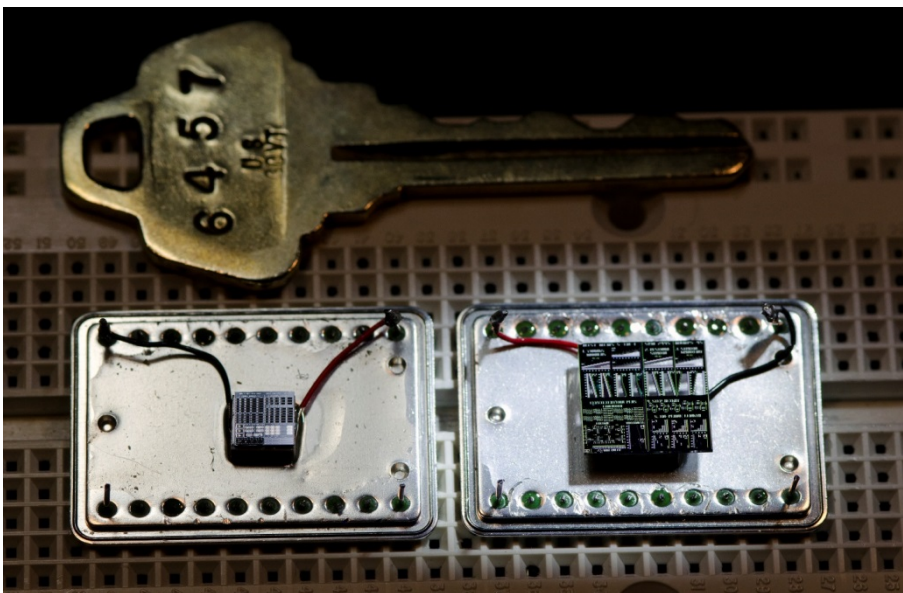
## NIST RM 8096 CMOS MEMS 5-in-1 Test Chip

### NIST RM 8097 MEMS 5-in-1 Test Chip

The reference materials (RMs 8096 and 8097) each consist of a single test chip that contains test structures from which material and dimensional properties are obtained using five documentary standard test methods (from which its name is derived). Companies can validate their use of the test methods by comparing their in-house measurements taken on the RM with NIST measurements taken on the same test structures.

The five standard test methods are used to obtain eight properties: Young's modulus, residual strain (and stress), strain (and stress) gradient, step height, in-plane length, and thickness. The MEMS Calculator website (Standard Reference Database 166) is used to perform the calculations. This website is accessible via the NIST Data Gateway (<http://srdata.nist.gov/gateway/>) with the keyword "MEMS Calculator."

There are two 5-in-1 test chips. RM 8096 was fabricated on a multi-user 1.5  $\mu\text{m}$  complementary metal oxide semiconductor (CMOS) process followed by a bulk-micromachining etch for which the material properties of the composite oxide layer are reported. RM 8097 was fabricated using a polysilicon multi-user surface-micromachining MEMS process with a backside etch for which the material properties of the first or second polysilicon layer are reported.



*RM 8096 is on the left and  
RM 8097 is on the right.*

*Technical Contact: Janet Cassard  
Email: [janet.cassard@nist.gov](mailto:janet.cassard@nist.gov)*

# Renewals

- SRM 1155a** Stainless Steel (Cr 18-Ni 12-Mo2) (AISI 316)
- SRM 1678c** Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 500  $\mu\text{mol/mol}$ ), Lot 04-L-XX
- SRM 2092** Low-Energy Charpy V-Notch Impact Specimen
- SRM 2096** High-Energy Charpy V-Notch Impact Specimen
- SRM 2619a** Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 0.5 % mol/mol), Lot 30-G-XX
- SRM 2740a** Carbon Monoxide in Nitrogen (Nominal Amount-of-Substance Fraction 10 % mol/mol), Lot 59-C-XX
- SRM 2764** Propane in Air (Nominal Amount-of-Substance Fraction 0.25  $\mu\text{mol/mol}$ ), Lot 2764-B-XX
- SRM 2810** Rockwell C Scale Hardness – Low Range
- SRM 2811** Rockwell C Scale Hardness – Mid Range
- SRM 2812** Rockwell C Scale Hardness – High Range
- SRM 3108** Cadmium (Cd) Standard Solution
- SRM 3114** Copper (Cu) Standard Solution
- SRM 3117a** Europium (Eu) Standard Solution
- SRM 3136** Nickel (Ni) Standard Solution
- SRM 3167a** Yttrium (Y) Standard Solution
- SRM 3168a** Zinc (Zn) Standard Solution
- SRM 4341a** Neptunium-237 Radioactivity Standard
- RM 8394** Tissue Engineering Reference Scaffolds for Cell Culture

# Revisions

## *Certificate Revisions: Are You Using These Materials?*

This is a list of our most recent certificate revisions. NIST updates certificates for a variety of reasons, such as to extend the expiration date or to include additional information gained from stability testing. Users of NIST Standard Reference Materials should ensure that they have the current certificates. You can print or view a copy of the current certificate at our website at <http://www.nist.gov/srm>, or contact the Office of Reference Materials at **phone** 301-975-2200, **fax** 301-926-4751, or **email** [srminfo@nist.gov](mailto:srminfo@nist.gov).

### **SRM 17f Sucrose Optical Rotation**

New expiration date : 01 July 2023

Editorial changes

### **SRM 909c Human Serum**

Technical changes

### **SRM 1453 Thermal Conductivity – Expanded Polystyrene Board**

Technical changes

Editorial changes

### **SRM 1494 Aliphatic Hydrocarbons**

New expiration date : 23 April 2023

Editorial changes

### **SRM 1685b Nitric Oxide in Nitrogen (Nominal Amount-of-Substance Fraction 250 $\mu\text{mol/mol}$ ), Lot 43-K-XX**

New expiration date : 02 November 2015

### **SRM 1689 Sulfur Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 5 $\mu\text{mol/mol}$ ), Lot 98-A-XX**

New expiration date : 02 November 2015

### **SRM 1828b Ethanol-Water Solutions (Six Levels)**

New expiration date : 30 April 2023

Editorial changes

### **SRM 1847 Ethanol-Water Solutions (Three Levels)**

New expiration date : 30 April 2013

Editorial changes

### **SRM 2074 Sinusoidal Roughness Specimen**

Editorial changes

### **SRM 2075 Sinusoidal Roughness Specimen**

Editorial changes

### **SRM 2260a Aromatic Hydrocarbons in Toluene**

New expiration date: 30 April 2023

Editorial changes

# Revisions (continued)

**SRM 2285 Ignitable Liquids Test Mixture**

New expiration date: 30 March 2023

Editorial changes

**SRM 2374 DNA Sequence Library for External RNA Controls**

Editorial changes

**SRM 2392 Mitochondrial DNA Sequencing**

New expiration date : 31 July 2018

Editorial changes

**SRM 2586 Trace Elements in Soil Containing Lead from Paint**

New expiration date : 30 September 2023

Editorial changes

**SRM 2587 Trace Elements in Soil Containing Lead from Paint**

New expiration date : 30 September 2023

Editorial changes

**SRM 2750 Methane in Air (Nominal Amount-of-Substance Fraction 50 µmol/mol), Lot 211-C-XX**

Editorial changes

**SRM 2751 Methane in Air (Nominal Amount-of-Substance Fraction 50 µmol/mol), Lot 212-C-XX**

Editorial changes

**SRM 2806a Medium Test Dust in Hydraulic Fluid**

New expiration date : 31 December 2014

Editorial changes

**SRM 2812 Rockwell C Scale Hardness – High Range**

Editorial changes

**SRM 2855 Additive Elements in Polyethylene**

New expiration date: 20 June 2019

Editorial changes

**SRM 2891 Ethanol-Water Solution (Nominal Mass Fraction 0.02 %)**

New expiration date: 31 January 2014

Editorial changes

**SRM 2892 Ethanol-Water Solution (Nominal Mass Fraction 0.04 %)**

New expiration date: 30 April 2023

Editorial changes



# Revisions (continued)

**SRM 2893 Ethanol-Water Solution (Nominal Mass Fraction 0.08 %)**

New expiration date: 30 April 2023

Editorial changes

**SRM 2894 Ethanol-Water Solution (Nominal Mass Fraction 0.01 %)**

New expiration date: 30 April 2023

Editorial changes

**SRM 2895 Ethanol-Water Solution (Nominal Mass Fraction 0.02 %)**

New expiration date: 30 April 2023

Editorial changes

**SRM 2896 Ethanol-Water Solution (Nominal Mass Fraction 0.03 %)**

New expiration date: 30 April 2023

Editorial changes

**SRM 2905 Trace Particulate Explosive Simulants**

New expiration date : 31 August 2020

Editorial changes

**SRM 3074 Phthalates in Methanol**

New expiration date : 30 March 2023

Editorial changes

**SRM 3287 Blueberry (Fruit)**

Technical changes

Editorial changes

**RM 8543 NBS 18 (Carbon Isotopes in Carbonatite)**

New expiration date : 31 December 2020

Technical changes

Editorial changes

## ORDER NIST SRMs ONLINE

You can now order NIST SRMs through our online ordering system, which is continually updated. This system is efficient, user-friendly, and secure. Our improved search function finds keywords on SRM detail pages as well as words in titles. **PLEASE NOTE:** Purchase orders and credit cards may be used when ordering an SRM online. Also note that we are placing many historical archive certificates online for your convenience.

**<https://www-s.nist.gov/srmors>**

### **Please Register Your SRM Online!**

**Registering will ensure that you will be notified of any technical updates or developments.**

[http://www.nist.gov/srm\\_reg](http://www.nist.gov/srm_reg)



## NIST SRM 2013 Exhibit Schedule

### **IFT-Food Expo**

*July 14-16, 2013*

Booth #4047

McCormick Place

Chicago, IL

### **NCSL Symposium**

*July 14-18, 2013*

Booth #705-707

Gaylord Opryland Resort

Nashville, TN

### **AACCC Clinical Lab Expo**

*July 28-August 1, 2013*

Booth #2026

George R. Brown Convention Center

Houston, TX

### **AOAC Association of Official Chemists**

#### **127<sup>th</sup> Annual Meeting**

*August 25-28, 2013*

Palmer House Hilton

Chicago, IL

### **ACS Fall Meeting**

*September 8-12, 2013*

Booth #301-303

Indianapolis Convention Center

Indianapolis, IN

### **Air Quality IXS**

*October 21-23, 2013*

Crystal Gateway Marriott

Arlington, VA

### **MS&T - Material Science & Tech Conference 13 and Exhibition, combined with ACerS 115<sup>th</sup>**

#### **Annual Meeting**

*October 27-31, 2013*

Booth #1210-1212

The Palais des congress de Montreal

Quebec, Canada

### **Material Research Society Fall Meeting**

*December 1-6, 2013*

Hynes Convention Center

Boston, MA

**IMPORTANT MESSAGE about accessing the SRM website at <http://www.nist.gov/srm>**

**PLEASE NOTE: New security settings to protect your private information have been mandated by the U.S. government. The following are instructions to upgrade your browser settings so you can view SRM documents, perform searches and order online.**

**For Mozilla Firefox**

- 1) You must have version 3.0.5 or later
- 2) Enable SSL 3.0
- 3) Enable TLS 1.0

To enable SSL 3.0 and TLS 1.0

- 1) Go to Tools > Options
- 2) Click on the Advanced icon
- 3) Click the Encryption tab
- 4) Under Protocols, make sure both boxes are checked

**For Internet Explorer**

- 1) You must have version 6.0 or later
- 2) Enable SSL 3.0
- 3) Enable TLS 1.0

To enable SSL 3.0 and TLS 1.0

- 1) Go to Tools > Internet Options
- 2) Click on the Advanced tab
- 3) Scroll down to Security
- 4) Make sure that both SSL 3.0 and TLS 1.0 are checked

# INTRODUCING OUR SRM MOBILE

Access our website on your mobile devices!  
<https://www-s.nist.gov/m-srmors>





## NIST Measurement Services Websites of Interest

### Standard Reference Materials



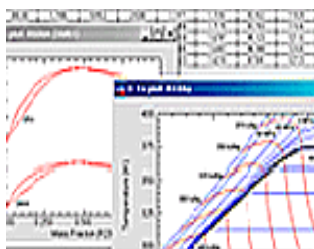
Standard Reference Materials

[www.nist.gov/srm](http://www.nist.gov/srm)

Historical Archived Certificates/Reports of Investigation

<https://www-s.nist.gov/srmors/certArchive.cfm>

### Standard Reference Data



NIST Scientific and Technical Databases

<http://www.nist.gov/srd>

NIST Data Gateway

<http://srdata.nist.gov/gateway>

### Calibrations



Calibrations Services

<http://www.nist.gov/calibrations>

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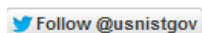
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