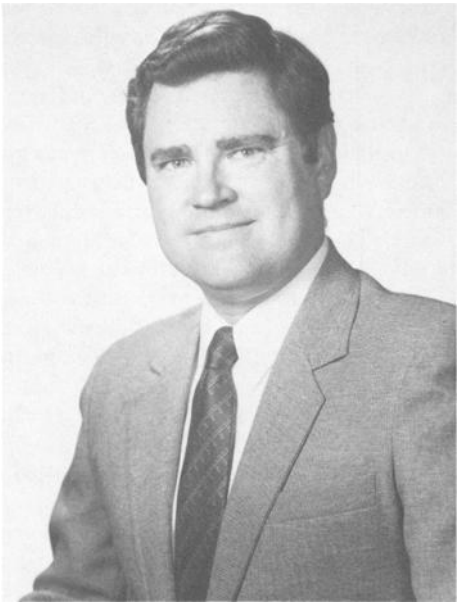
GUEST EDITORIAL



Stanley D. Rasberry, Chief
Office of Standard Reference Materials

Standard Reference Materials

For more than 80 years the National Bureau of Standards (NBS) has issued Standard Reference Materials (SRMs) to help people measure more accurately and have greater confidence in their technical investigations. I was especially pleased when the editor of your journal, Dr. Abel Dominguez, asked me to report to you those aspects of this program of greatest interest in forensic sciences. Not only do I appreciate the opportunity to give you that report, I also see the chance of opening communications with some of you to see what new directions NBS might take to address unmet requirements in the field.

The International Organization for Standardization has defined, in its Guide 30-1981, the term reference material as:

> A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

In forensic science, instrument calibration or assessment of a method are of more frequent interest than the final role mentioned, that of "assigning values to materials," the latter usually being of greater interest to material scientists and metrologists. The National Bureau of Standards is authorized by Congress to provide the primary measurement standards to be used in the United States.

Today, more than 1000 Standard Reference Materials are available from NBS. About two thirds of the types available are certified for chemical composition, and the remainder support the measurement of physical and engineering properties. The range of types is quite broad: metals alloys, environmental materials, clinicals, foods, industrial hygiene, glasses, cements, coating thickness, density, micrometrology, radioactivity, fuels, and nondestructive material testing to name just a few of the general categories.

Only a few SRMs have been certified specifically for use in forensic science studies. However, the field of forensic science is so wide-ranging that many investigations may benefit from the use of one or more available SRMs. Standard Reference Materials are available for calibrating wavelength and intensity scales of such instruments as spectrophotometers, X-ray diffraction spectrometers, atomic absorption and inductively coupled plasma spectrometers (note that 69 single-element solution standards are now offered), and other types of analytical instruments. Magnification and resolution SRMs are issued for scanning electron as well as optical microscopes. Others are provided for testing the sensitivity of gas chromatograph-mass spectrometer systems and for establishing the scale of pH.

One of the most interesting in the class of instrument performance standards is SRM 1965, which consists of arrays of small polystyrene spheres mounted on a microscope slide. The spheres have exceptional homogeneity of diameter and are certified for diameter at 9.94 $\pm$ 0.04 μm. In application, the slide permits rapid, full-field, two-dimensional calibration of magnification, and other performance tests, for optical microscopes. The spheres on the slide were produced in space aboard the shuttle *Challenger* to gain uniformity of diameter and sphericity, and indeed, are the first material ever returned from space to be put to commercial use. *R & D Magazine* recognized this achievement through the honor of an "IR 100 Award" in 1986, which was given to the four collaborators who produced the SRM: Lehigh University, National Aeronautics and Space Administration (NASA), American Society for Testing and Materials (ASTM), and, of course, NBS.

Turning from the more general instrument performance SRMs to specific matrix types, we find some that will have utility to specific forensic science applications. One of the most obvious is Bullet Lead, SRM C2416. This material, certified for concentrations of minor and trace constituents, is especially intended for calibrating optical emission spectrometric methods of analysis used to identify and match sources of bullet lead. It is typical of many SRMs in that it has been prepared and certified with industrial and university laboratories working together with NBS and with the cooperation of ASTM.

Accurate refractive index of glass measurements may be critical to some investigations. Several SRMs, including SRM 1822, Soda-Lime Glass, are available for calibrating refractometers and certifying the refractive index of immersion liquids by microscope methods.

A number of Standard Reference Materials have been or are being certified for the concentrations of various constituents in blood and urine. Some of these include: Human Serum, SRM 909; Lead in Blood, SRM 955; Toxic Metals in Urine, SRM 2670; Fluoride and Mercury in Urine, SRMs 2671a and 2672a, respectively; THC in Urine, SRM 1507; and Cocaine Metabolite in Urine, SRM 1508.

Forensic scientists faced with calibrating breath-alcohol analyzers or those who must determine the ethanol content in blood may be interested in SRM 1828, Ethanol-Water Solutions. This material has separate vials with ethanol content at three levels: 95.629, 0.2992, and 0.1487 weight percents.

Obviously, each specialist has very specific needs for reference materials. Since I have indicated only a small selection of the total available, it is likely that I have missed the very one of interest to you. I invite you to contact NBS for a free catalog covering all types. If you do not find what you need there, please write us to see if we might be able to produce a new SRM.

Let me conclude by wishing each reader success in your future developmental and investigative endeavors. From those laboratory assignments in which I have been able to provide

analytical assistance to a forensic scientist I have a partial understanding of the exacting demands placed on you in your quest for the true facts in an investigation. I hope that Standard Reference Materials will be useful to you and that you will contact us with your comments and requirements.

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