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Technical Note 2017-03

Mercury Telluride (HgTe) Calibration Standards for the Determination of Mercury – Product Information

New reference material to replace silver amalgam films

Version April 17, 2017

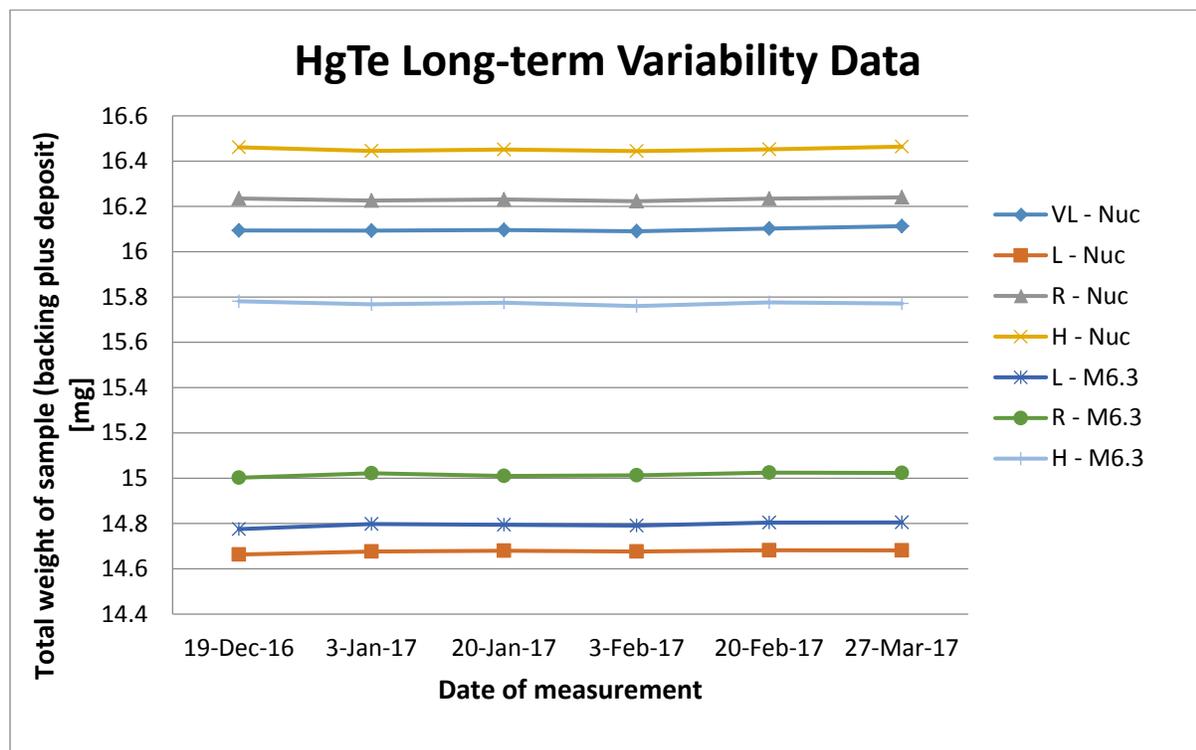
Micromatter recently introduced mercury-(II) telluride (HgTe) standards to replace our previously distributed silver amalgam films for the quantification of mercury. This change was made to improve the overall quality of our mercury standards and to render the manufacturing process more consistent. While both AgHg and HgTe can be used interchangeably for mercury calibrations, HgTe standards have some benefits over AgHg.

1. HgTe is manufactured using a one-step vacuum deposition technique, similar to most Micromatter calibration standards. AgHg had to be manufactured in a more complex process that required exposing a fresh coating of elemental silver to mercury vapours at high temperature to achieve amalgamation, which sometimes led to slightly non-uniform deposits. In contrast, the vacuum deposition of HgTe ensures excellent uniformity of the coating across the surface of the standard.
2. Unlike AgHg, the manufacture of HgTe standards does not involve the handling of toxic mercury vapours.
3. HgTe is a common material used in several industries, such as semiconductor manufacturing, and is readily available.
4. HgTe is a rather inert compound and a stable calibration material. AgHg standards could only be certified to our $\pm 5\%$ tolerance after encapsulation, as silver amalgam loses small amounts of mercury over time. HgTe standards do not require encapsulation.
5. HgTe thin films are not expected to decompose significantly over time if stored and used in accordance with Micromatter's recommendations (room temperature, desiccator). For detailed information, please refer to Micromatter Technical Note 2017-01: Storage, Handling and Expiry of XRF Calibration Standards.

Stability Evaluation

Mercury telluride evaluation samples were prepared in four different area weights - very light (VL): 3-8 $\mu\text{g}/\text{cm}^2$; light (L): 15-25 $\mu\text{g}/\text{cm}^2$; regular (R): 40-60 $\mu\text{g}/\text{cm}^2$; and heavy (H): 80-120 $\mu\text{g}/\text{cm}^2$. Films were deposited on our two standard substrates, namely Nuclepore[®] aerosol membrane and Mylar[®] 6.3 μm polyester film, respectively. Seven evaluation samples were produced. Weighing data were collected over a period of three months as shown in the graph below.

The HgTe standards thus produced were stored at room temperature at relative humidity between 30 and 40%.



During the test period, the standards were repeatedly weighed with 0.1 μg accuracy on a Mettler ME-30 microbalance and measured on an EDXRF analyzer at the same time points to verify the contents of Hg and Te.

We found no significant increase or decrease in the weight of the films, indicating that the samples did not absorb moisture, nor lost mercury, over the period of evaluation.

The spectroscopic data confirmed that the elemental composition of the evaluation samples remained unchanged.

Micromatter strives to continuously improve the products we offer to our customers, and we hope that the novel calibration materials described here will meet with our customers' approval. Please do not hesitate to contact us if you have any questions or concerns. Thank you.