Mercury Telluride XRF Calibration Standards

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Mercury (Hg) is one of the most hazardous environmental pollutants. It exists in a large number of physical and chemical forms; individual properties of the element and its compounds determine its complex environmental distribution, biological enrichment and eventually its toxicity. The most frequently encountered chemical forms are elemental mercury (Hg^0), inorganic mercury (mainly Hg^{2+}), monomethylmercury (MMHg, CH_3Hg^+) and dimethylmercury (DMHg, CH_3HgCH_3). The toxic effects of mercury depend on various properties of the respective mercury compound, such as its solubility, valence state and lipophilicity.

X-ray fluorescence (XRF) spectrometry is routinely used for monitoring Hg in various industries and for measuring Hg traces in food or consumer products. Calibration of XRF analyzers is usually achieved using amalgam standards (Ag-Hg), which may release small quantities of Hg over time if exposed to air, which affects the accuracy of the calibration.

For several years, MICROMATTER has been providing encapsulated (sealed) Ag-Hg amalgam XRF calibration standards on Mylar® to customers [1]. These Ag-Hg standards are stable and have been widely used for the quantification of mercury, however, they are comparatively difficult to manufacture and require a special time-consuming encapsulation technique.

Recently, MICROMATTER has developed new calibration standards for mercury based on mercury telluride, HgTe, which is a stable compound that is readily available and used in the semiconductor industry. These HgTe standards are produced using a one-step ultra-high vacuum deposition, resulting in excellent surface uniformity. In this paper, the manufacturing and calibration methods as well as data on the variation of the mercury concentration over time will be presented.

Reference

[1] V. Jaggi, R.R. Pandey, S.K. Zeisler: Encapsulated Ag-Hg XRF Calibration Standards for Mercury. Denver X-ray Conference (2015).

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