VSL
Dutch Metrology Institute

Traceability of mercury vapor

Mercury vapor generator

A mercury vapor generator is being developed at VSL to establish traceability of mercury measurement results at ambient air levels (1–2 ng Hg/m^3). Current measurement capabilities are maintained at levels of 0,5–60 µg Hg/m^3, whereas the aim of the new mercury vapor generator is to realize traceability at a level of ≤ 15 ng Hg/m^3.

In order to realize traceability at this low mercury vapor contents level, innovations included a strongly modified type of diffusion cell, a new measurement method to weigh the loss in (mercury) mass of these diffusion cells during use (ca. 6-8 µg mass difference between successive weighings), and a new housing for the diffusion cells to maximize flow characteristics and to minimize temperature variations and adsorption effects.

The newly developed mercury vapor generator will contribute to more reliable measurement results of mercury vapor at ambient and background air levels, and will also contribute to higher safety standards and cost reductions, for example in the field of LNG, where aluminum Main Cryogenic Heat Exchangers are used that are particular prone to corrosion caused by mercury.

Mercury

Mercury is a major global, regional and national challenge in terms of threats to human health and the environment, especially to the health of pregnant women and babies worldwide or to marine mammals in places like the Arctic, via the eating of contaminated fish.

Furthermore, mercury is reactive, difficult to store and handle, and extremely difficult to measure at all as it easily disappears/adsorbs in sample containers even before the measurement analysis is being carried out.

Current traceability of mercury vapor

The majority of measurements of mercury vapor are currently traceable to the vapor pressure of mercury. A static head space generator (bell-jar apparatus) allows a saturated concentration of mercury to develop in air, from which a known amount of mass of mercury can be removed for calibration purposes.

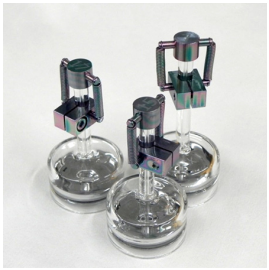
Several empirical equations are available to describe the vapor pressure of mercury at a given temperature, but the agreement between them is not good as data from different equations sometimes do differ 5% or even more.

VSL
Dutch Metrology Institute

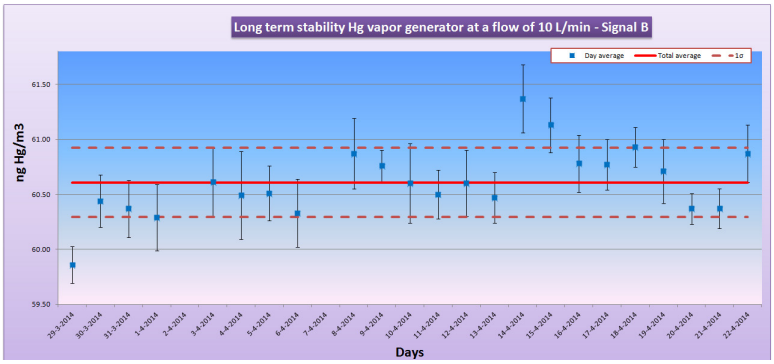
Beyond all Doubt

Mercury vapor generation by diffusion

The newly developed mercury vapor generator system was tested by using diffusion cells generating 0.8 ng Hg/minute and 16 ng Hg/minute.



The results also show that the filter system, to produce mercury free air, is working properly. Furthermore, and most importantly, the system is producing a flow with a stable mercury vapor content.



Some additional improvements are still required to allow the devel-oped mercury vapor generator to produce SI traceable mercury vapor concentrations, based upon gravimetry, at much lower concentration levels and reduced measurement uncer-tainties than have been achieved previously.

The challenges to be met are especially related to developing more robust diffusion cells and to develop better mass measurement conditions.

Publication

Further information can be found in a paper recently published:
http://stacks.iop.org/0957-0233/25/115801

More information

If you want to know more about the possibilities VSL has to offer in the field of mercury measure-ments, please contact:

Mr Hugo Ent

E vsl@vsl.nl
T +31 (0)15 269 1609

VSL
Thijsseweg 11
2629 JA Delft
P.O. Box 654
2600 AR Delft
The Netherlands

www.vsl.nl