Geophysical Research Abstracts
Vol. 19, EGU2017-8971, 2017
EGU General Assembly 2017

New SI-traceable reference gas mixtures for sulfur hexafluoride (SF_6) at the pmol/mol level using static and dynamic preparation methods and comparison to existing scales

Simon A. Wyss (1), Myriam Guillevic (2), Martin Vicar (3), Gerard Nieuwenkamp (4), Martin K. Vollmer (1), Céline Pascale (2), Stefan Reimann (1), Bernhard Niederhauser (2), and Lukas Emmenegger (1)

(1) Laboratory for Air Pollution and Environmental Technology, Empa, Swiss Federal Laboratories for Materials Science and Technology, Dübendorf, Switzerland (Simon.Wyss@empa.ch), (2) Laboratory Gas Analysis, METAS, Federal Institute of Metrology, Bern, Switzerland (Myriam.Guillevic@metas.ch), (3) Department of primary metrology of pressure, vacuum and low mass flow rate, Czech Metrology Institute, Brno, Czech Republic (mvicar@cmi.cz), (4) VSL, Delft, The Nederlands (gnieuwenkamp@vsl.nl)

We developed two SI-traceable methods, using both static and dynamic preparation steps, to produce reference gas mixtures for sulfur hexafluoride (SF_6) in gas cylinders at pmol/mol level. This research activity is conducted under the framework of the European EMRP HIGHGAS project, in support of the high quality measurements of this important greenhouse gas in the earth's atmosphere.

In the method used by the Czech Metrology Institute (CMI) a parent mixture of SF_6 in synthetic air was produced in an aluminium cylinder at VSL as a first step. This mixture was produced gravimetrically according to ISO 6142 at an amount fraction of 1 μmol/mol. In the second step this primary standard was further diluted to near-ambient amount fraction, with the use of a three-step dilution system and directly pressurised into aluminium cylinders to a pressure of 10 bars.

The second method used by the Federal Institute of Metrology (METAS) has already been applied to other fluorinated gases such as HFC-125 and HFC-1234yf. In this method a highly concentrated mixture is produced by spiking a purified synthetic air (matrix gas) with SF_6 from a permeation device. The mass loss of SF_6 in the permeation device is observed by a magnetic suspension balance. In a second step this mixture is diluted with matrix gas to the desired concentrations. All flows are controlled with mass flow controllers. The diluted gas was transferred into Silconert2000-coated stainless steel cylinders by cryo-filling.

The final gas mixtures at near-ambient amount fraction were measured on a Medusa gas chromatography-mass spectrometry system (Medusa-GC/MS) against working standards calibrated on existing scales of the Scripps Institution of Oceanography (SIO) and compared to other scales [1].

The agreement of the assigned values by the CMI and METAS, with the measured values referenced on the SIO scale was excellent. This results show that with this methods we are able to produce accurate SI-traceable gas mixtures at near-ambient amount fraction for SF_6, without extensive static dilutions.

[1] Benjamin R. Miller, Ray F. Weiss, Peter K. Salameh, Toste Tanhua, Brian R. Greally, Jens Mühle, Peter G. Simmonds, *Anal. Chem.,* **2008**, 80, 1536.