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EMRP JRP MetNH3: Towards a Consistent Metrological Infrastructure for Ammonia Measurements in Ambient Air

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Measuring ammonia in ambient air is a sensitive and priority issue due to its harmful effects on human health and ecosystems. In addition to its acidifying effect on natural waters and soils and to the additional nitrogen input to ecosystems, ammonia is an important precursor for secondary aerosol formation in the atmosphere. The European Directive 2001/81/EC on "National Emission Ceilings for Certain Atmospheric Pollutants (NEC)" regulates ammonia emissions in the member states. However, there is a lack of regulation regarding certified reference material (CRM), applicable analytical methods, measurement uncertainty, quality assurance and quality control (QC/QA) procedures as well as in the infrastructure to attain metrological traceability.

As shown in a key comparison in 2007, there are even discrepancies between reference materials provided by European National Metrology Institutes (NMIs) at amount fraction levels up to three orders of magnitude higher than ambient air levels.

MetNH3 (Metrology for ammonia in ambient air), a three-year project that started in June 2014 in the framework of the European Metrology Research Programme (EMRP), aims to reduce the gap between requirements set by the European emission regulations and state-of-the-art of analytical methods and reference materials.

The overarching objective of the JRP is to achieve metrological traceability for ammonia measurements in ambient air from primary certified reference material CRM and instrumental standards to the field level. This requires the successful completion of the three main goals, which have been assigned to three technical work packages:

To develop improved reference gas mixtures by static and dynamic gravimetric generation methods

Realisation and characterisation of traceable preparative calibration standards (in pressurised cylinders as well as mobile generators) of ammonia amount fractions similar to those in ambient air based on existing methods for other reactive analytes. The aimed uncertainty is < 1 % for static mixtures at the 10 to 100 μmol/mol level, and < 3 % for portable dynamic generators in the 0 to 500 nmol/mol amount fraction range. Special emphasis is put on the minimisation of adsorption losses.

To develop and characterise laser based optical spectrometric standards

Evaluation and characterisation of the applicability of a newly developed open-path as well as of existing extractive measurement techniques as optical transfer standards according to metrological standards.

To establish the transfer from high-accuracy standards to field applicable methods

Employment of characterised exposure chambers as well as field sites for validation and comparison experiments to test and evaluate the performance of different instruments and measurement methods at ammonia amount fractions of the ambient air.

The active exchange in workshops and inter-comparisons, publications in technical journals as well as presentations at relevant conferences and standardisation bodies will transfer the knowledge to stakeholders and end-users.

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