



Advanced metrology for trace level oxygenated VOCs measurement to underpin ambient monitoring

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Oxygenated Volatile Organic Compounds (OVOCs) are a group of organic chemicals that have low boiling points and high vapor pressures at ambient conditions. They are present in the atmosphere at trace levels (part-per-billion) and they are relevant oxidation products from anthropogenic and biogenic origin.

The measurement of OVOCs, which plays a key role in the chemistry of the atmosphere affecting climate and air quality, is essential. To ensure accuracy and traceability of the measurement results, the World Meteorological Organization Global Atmosphere Watch (WMO-GAW) VOC network needs high metrological OVOCs gaseous reference standards with long-term stability to perform the calibration of analytical equipment. However, the monitoring of OVOCs like methanol and ethanol is particularly challenging due to the strong interaction of these species with the contact material surface.

Recently, VSL has developed static gas standards in high pressure cylinders containing OVOCs in the range 10 $\mu\text{mol/mol}$ to 100 nmol/mol in nitrogen, including methanol, ethanol, acetone, acetaldehyde, methacrolein, methyl ethyl ketone (MEK) and methyl vinyl ketone (MVK). These gas standards are prepared by a state-of-the-art gravimetric preparation method. To develop accurate gas standards, high-pressure cylinders in aluminum with different proprietary treatments have been tested to evaluate possible OVOCs interaction with the contact surfaces upon gas mixture preparation. The best performing cylinder types have been further investigated to verify the gas composition long-term stability (for over 24 months). The results of the studies show that some OVOCs interact strongly with the contact surfaces. To ensure accurate measurements of gas mixture composition, OVOCs standard gas mixtures at similar levels have been obtained by dynamic methods. With these methods, the effect of the contact surface on the OVOCs gas mixture composition is evaluated. The presentation shows the results of obtained during the development of these important gas standards for monitoring climate change and air quality.