



Cavity prototype of NICE-OHMS spectrometer developed for MetAMC

Online AMC measurement based on NICE-OHMS

AMC measurement has become a prerequisite for small-scale manufacturing processes in clean rooms and facilitates higher product yields and quality. Within the EMRP project MetAMC, NPL has developed a high-sensitivity spectroscopic system for AMC detection (a “Noise Immune Cavity Enhanced Optical Heterodyne Molecular Spectroscopy system or NICE-OHMS), specifically targeting ammonia. Detection of water vapour has also been demonstrated with this system; formaldehyde detection is also possible by substituting the 1531 nm laser with one emitting at a different wavelength (1512 nm).

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Technical description

NICE-OHMS is a form of optical molecular spectroscopy that combines the advantages of the increased path length of an optical cavity with the shot-noise detection limit of high frequency modulation spectroscopy. NICE-OHMS offers potentially the greatest sensitivity for optical AMC detection; a fully optimised system is expected to be capable of ppt (pmol/mol) sensitivity within a few seconds of measurement time for some AMCs. This is significantly better than current commercial systems based on cavity enhanced ring-down measurements. The NPL device is capable of trace detection of water, ammonia and formaldehyde.

Through the knowledge accumulated in the course of the MetAMC project, NPL can offer expertise to industrial partners who are interested in developing NICE-OHMS into a fully turn-key system for clean-room AMC monitoring. Co-funding opportunities may be available for this work.

Advantages of NICE-OHMS

- High AMC detection sensitivity
- Real-time measurement
- Traceability through reference gas mixtures or molecular parameters

Economic significance

AMCs affect the product yield and inhibit the advance to smaller scale manufacturing techniques. The effective implementation of AMC monitoring equipment can enable more cost efficient fabrication and fabrication of new, innovative products and thus increase overall competitiveness.

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