



Measurement of Environmental NO₂ by Photoacoustic Spectroscopy

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The most widely used technique for the measurements of nitrogen dioxide (NO₂) is the chemiluminescence technique. However this indirect NO₂ measurement method is affected by positive or negative interferences due to the use of non selective catalyzer molybdenum or photolytic converter [1]. Photoacoustic spectroscopy (PAS) offers the capability of interference-free direct NO₂ measurement without any sample preparation or/and chemical conversion [2,3].

In this paper, we report on the development and applications of a photoacoustic spectroscopy-based NO₂ sensor for continuous measurement of NO₂ in air with a sensitivity of about 0.5 ppb (SNR=1) and 1 min time resolution. Time series measurements of environmental NO₂ concentrations were carried out and compared with side-by-side measurements by a NO_x analyzer (AC-31 M). Good agreement has been observed.

Experimental detail and preliminary results will be presented.

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References

- [1] G. Villena, I. Bejan, R. Kurtenbach, P. Wiesen, J. Kleffmann, "Interferences of Commercial NO₂ instruments in the urban atmosphere and in a smog chamber", *Atmos. Meas. Tech.* 5 (2012) 149.
- [2] M. Lassen, D. B. Clsusen, A. Bruschi, J. C. Petersen, "A versatile integrating sphere based photoacoustic sensor for trace gas monitoring", *Opt. Express* 22 (2014) 11660.
- [3] C. Haisch, R. Niessner, "Photoacoustic analyzer for the artifact-free parallel detection of soot and NO₂ in engine exhaust", *Anal. Chem.* 84 (2012) 7292.