LED-based photoacoustic detection of nitrous oxide

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Motivation

Low-cost gas sensors;

First photoacoustic N_2O detector based on an LED;

Trace gas level detection;

Application in medical, industry and agriculture.

MIR-LED emission band

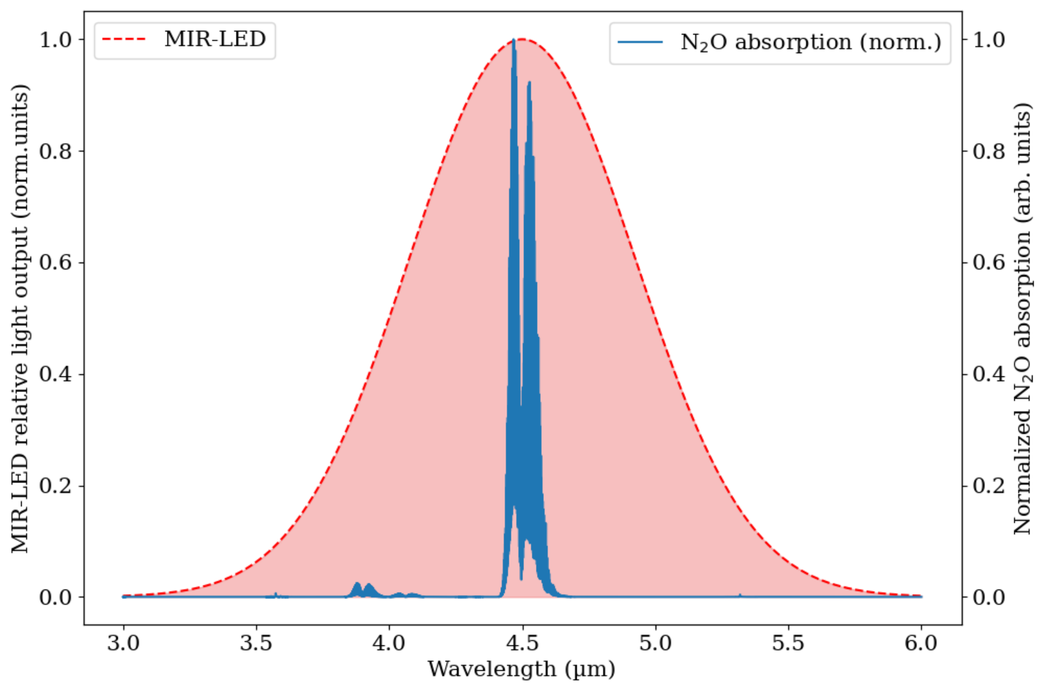

Figure 2 - Hitran absorption spectra of N_2O [10]. The blue area below the dashed line represents the MIR-LED emission.

Experimental setup

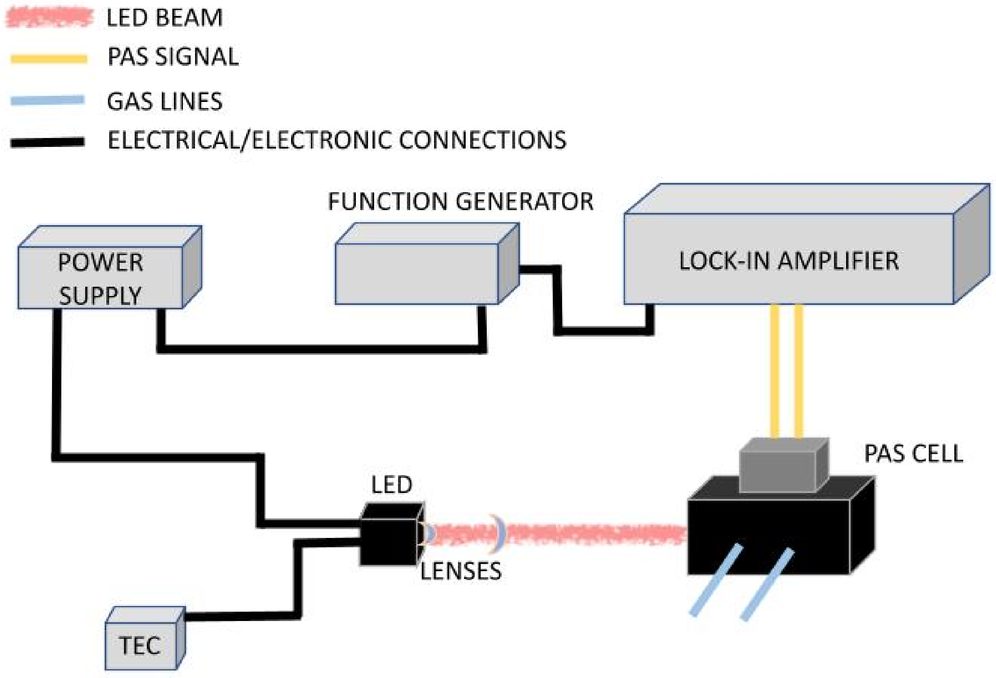

Figure 1 – Photoacoustic spectrometer setup.

Radiation source: MIR LED—Nanoplus GmbH (4.5 µm);

Photoacoustic sensor: Differential photoacoustic cell;

Lock-in amplifier: Signal Recovery 7265;

Collimating lens: aspherical lens: d = 5.5 mm and f = 1.873 mm, a bi-convex lens: d = 25.4 mm and f = 200.0 mm, THORLABS.

Results and conclusion

Detection of N_2O the ppm level (100 ppm);

Reduction of experimental costs compared to QCL;

Flexibility to adapt new photoacoustic cell designs to improve detection limit.

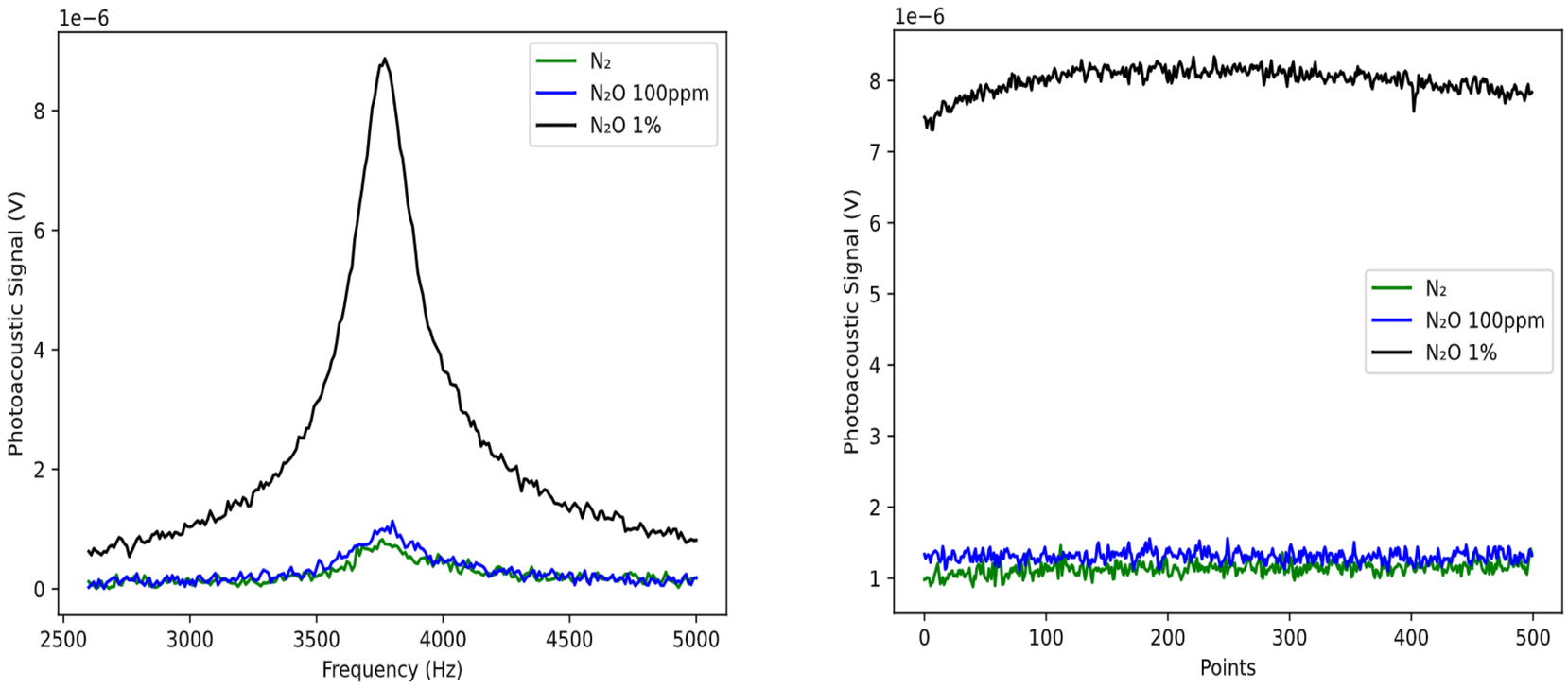

Figure 3 - Frequency sweep (left) and photoacoustic signal for N_2O and background (N_2).

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