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High-resolution Fourier-transform cavity-enhanced absorption spectroscopy in the near-infrared using an incoherent broad-band light source

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An incoherent broad-band cavity-enhanced absorption (IBBCEA) set-up was used in combination with a Fourier-transform (FT) spectrometer in order to explore the potential of this technique for high resolution molecular spectroscopy in the near-infrared region.[1]

Absorption spectra of overtone bands of CO_2, OCS, and $HD^{18}O$ were measured between 5800 and 7000 cm^{-1} using a small sampling volume (1100 cm^3, based on a 90 cm cavity length). The quality of the spectra in this study is comparable to that obtained with Fourier transform spectrometers employing standard multi-pass reflection cells, which require substantially larger sampling volumes.

High-resolution methods such as FT-IBB-CEAS also provide an elegant way to determine effective mirror reflectivities (R_{eff}, i.e. a measure of the inherent overall cavity loss) by using a calibration gas with well known line strengths. For narrow absorption features and non-congested spectra this approach does not even require a zero-absorption measurement with the empty cavity. Absolute cross-sections or line strengths of a target species can also be determined in one single measurement, if gas mixtures with known partial pressures are used. This feature of FT-IBB-CEAS reduces systematic errors significantly; it is illustrated based on CO_2 as calibration gas.

[1] J. Orphal and A. A. Ruth, "High-resolution Fourier-transform cavity-enhanced absorption spectroscopy in the near-infrared using an incoherent broad-band light source", *Optics Express* **16**, 19232-19243, 2008.