

Mid-IR laser spectroscopy for sensitive remote gas sensing

ESR 3: Rasmus Pedersen; Lund University, Physics Department, Division of Combustion Physics

Long term goals:

- Sensitive spatially resolved temperature measurements in gas
- Sensitive spatially resolved concentration measurements in gas

Work will focus on reaching these goals by developing infrared polarization spectroscopy (IRPS) and infrared degenerate four wave mixing (DWFM), and combining it with upconversion detection.

Current Results

The initial work have focused on achieving quantitative detection of the methyl radical. The reason for this is that while this radical is central to the combustion of hydrocarbons, it is difficult to measure because of its reactive nature.

For quantitative measurements, we do signal calibration measurements with a stable species (CH_4) and temperature measurements using infrared waterlines.

Currently we are doing the final measurements and data analysis for a presentation of this for the Photonics West conference.

Planned secondments

- ICFO: Testing an ICFO OPO for DWFM for acetylene concentration measurements. Planned in February-Marts
- Hosting ESR 15: Seeding an IR-OPO for single mode operation, and using it for concentration and temperature measurements. Planned in April.

Publications:

- Under review: "Mid-infrared polarization spectroscopy measurements of species concentrations and temperature in a low pressure flame" in Combustion and flame. First author: Anna-Lena Sahlberg
- Planned: "Polarization Spectroscopy with Upconversion Detector for Detection of CH_4 and CH_3 in Flame", conference contribution, Photonics West

ETCS Points

- 44.5/75

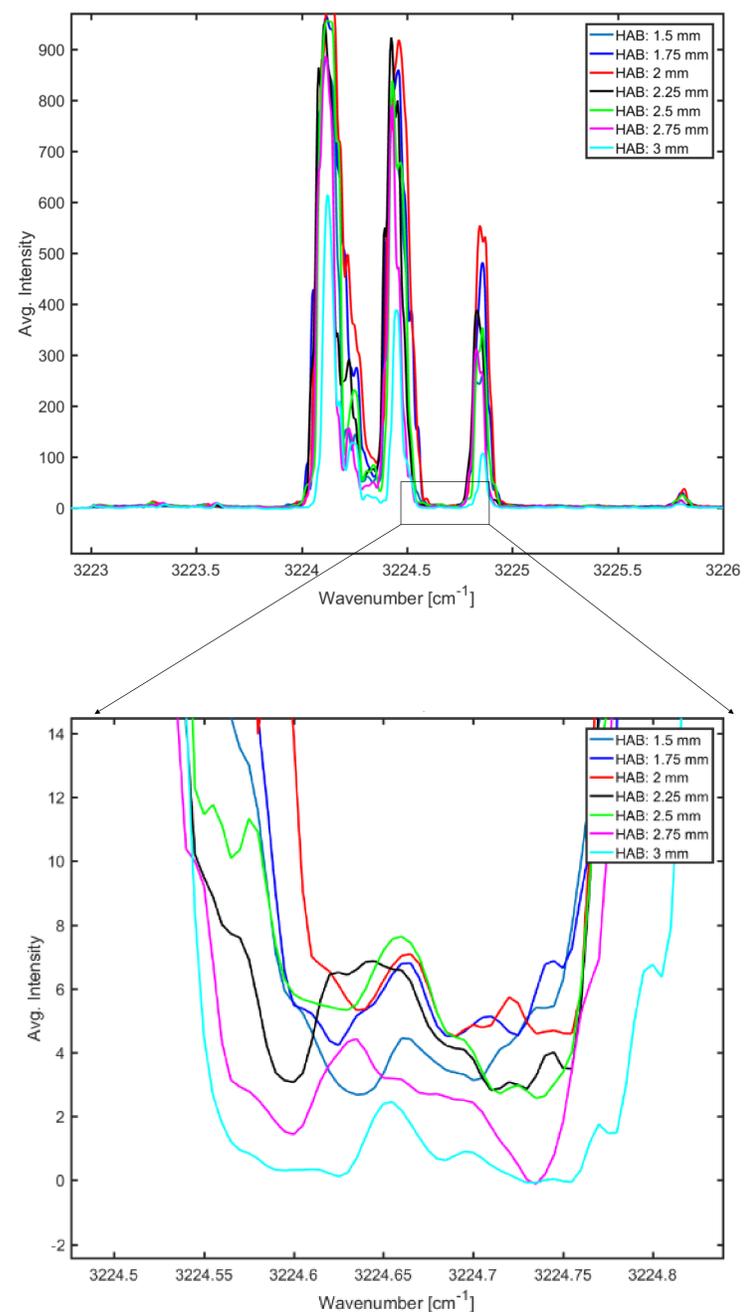


Fig. 1: Spectra taken at different heights above the burner (HAB) in a methane/oxygen flame. The three largest peaks are methane peaks, the central peak in the zoom-in is attributed to the methyl radical.

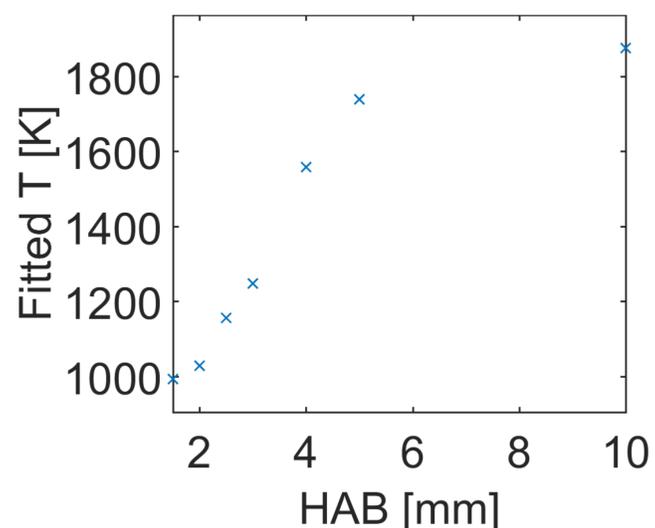


Fig. 2: Temperature curve measured for the flame.