

**PAC****Process Analytical Chemistry - Data Acquisition and Data Processing**

Main location	Vienna (Vienna)
Other locations	Vienna, Kundl (Tirol), Salzburg, Lenzing (Upper Austria), Krems (Lower Austria)
Thematic field	Gaining valid chemical information directly from the process streams of chemical and biochemical industry, inline and in real-time.

Success story summary**Novel technology for analytics of gases – implemented in 3 prototypes**

Mid-infrared (MIR) spectroscopic direct absorption techniques employing novel MIR technologies were established, optimized and implemented into on-line and at-line operating prototypes at three different settings at the industrial cooperation partners.

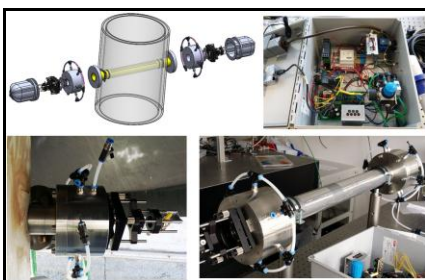
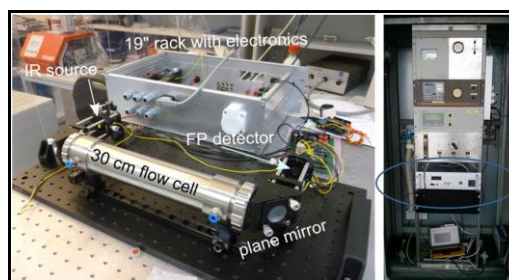
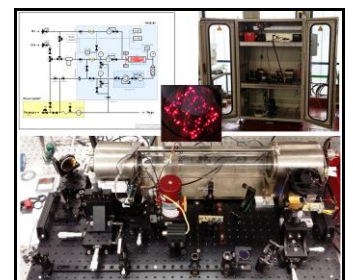
Success story

In one sub-project of the K-Project PAC, the researchers from Technical University Vienna established and optimized three different novel technologies for analyzing components of gas streams. Still within the running project they managed to implement the technologies in prototypes, demonstrating their capabilities outside of the laboratories, in the real industrial environment at the company partners. The highly skilled optimization of the components utilized for the novel mid-IR gas phase spectroscopy systems made those tests a great success.

At the project partner **Nufarm**, carbon dioxide (CO₂) and hydrocarbon (HC) levels are monitored in an exhaust gas stream. Novel MIR-filter technology is paired with an efficient MIR-emitter by means of a cross-stack configuration with integrated optics.

At the project partner **Metadynea**, the concentration of methylformiate (MF) and methanol (MeOH) is monitored in a continuous product stream. In this setup a scanned absorption measurement technique through a thermostated 30 cm gas cell is realized with a novel tunable Fabry-Pèrot filter-detector in combination with an efficient pulsed MIR source.

At the project partner **OMV**, traces (sub-ppm) of gaseous hydrogen sulfide (H₂S) in process gases are measured. The researchers implemented an advanced wavelength modulation spectroscopy techniques with continuous wave-quantum cascade laser (cw-QCL) and room temperature precision thermoelectrically cooled MIR-detectors. In this prototype setup the laser beam is precisely folded into a 50 cm low pressure gas cell in order to yield an interaction path-length of 100 m. The laser emission is high frequency modulated and rapidly swept in a periodic fashion in order to be processed into a high resolution mini-spectrum of the gas phase components containing the concentration information. The optical laser spectroscopy setup together with a fully automated gas probing and conditioning system including all necessary safety equipment for the use in petrochemical areas is housed into an industry test rig.

**Cross Stack CO₂/HC prototype****MF/MeOH prototype****cw-QCL H₂S prototype****Impact and effects**

The realized installations provide real time information on the concentration of target gases in process streams of three industrial partners at different concentration levels. This information is crucial for gaining in-depth process understanding and to ensure optimum process operation conditions. Furthermore, the developed prototype technology will be transferred to Austrian instrument companies i-RED and QuantaRed for further instrument development.

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