

APPLICATION LABORATORY INFRARED LASERS
REAL-TIME MIR SPECTROSCOPY OF CHEMICAL SUBSTANCES



APPLICATION LABORATORY FOR IR LASER SPECTROSCOPY

IDENTIFYING SOLIDS AND LIQUIDS FOR YOU

How do chemical compounds change under external influences? What is the chemical composition of certain solutions or liquids? Are chemical traces left on a surface? The Fraunhofer Institute for Applied Solid State Physics IAF provides answers to these questions: Our infrared spectroscopy detects and quantifies even small traces of substances or chemical reactions, based on their molecular composition.

In our application laboratory, we offer spectroscopic measurements with our fast tunable quantum cascade lasers (QCLs). This innovative technology is based on wavelengths in the mid- to long-wave infrared range and identifies chemical substances far more reliably than comparable spectroscopic measurement techniques in the near infrared wavelength range. It facilitates clear identification of various solids and liquids within a few seconds only – culminating in real-time measurements.

Continuous on- and inline process analysis in real time offers an enormous potential gain in efficiency as well as cost savings for the development and optimization of production processes, e. g. in the chemical or pharmaceutical industry. The influence of parameters such as temperature and pressure can directly be monitored and optimized for enhanced yield and reduced production time. It is thus possible to develop e. g. new pharmaceutical products faster and at lower costs. The QCL has established itself as an ideal laser light source for innovative infrared spectroscopy techniques in the past years. Thanks to its broad spectral tunability in the infrared wavelength range between 4 μm and 11 μm , as well as its high spectral brilliance, the QCL is ideally suited for a wide range of measurement tasks.



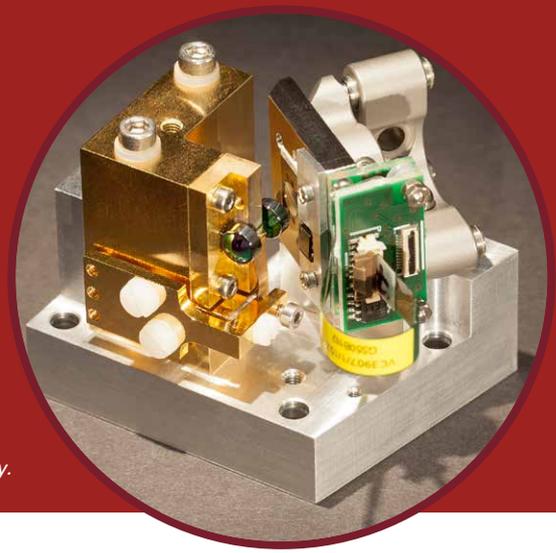
*Measurement setup for the
standoff detection of
chemical materials.*

2000 SPECTRA PER SECOND

Speed of analysis of the infrared laser.

About Fraunhofer IAF

Fraunhofer IAF is one of the leading research institutions worldwide in the field of III-V semiconductors. We develop electronic and optoelectronic devices based on modern nano- and microstructures. The focus of the business unit »Semiconductor Lasers« lies on the development of infrared semiconductor lasers and laser systems for the 2 μm to 11 μm wavelength range. Furthermore, we optimize components and systems for laser applications in medical diagnostics, process control, or safety technology.



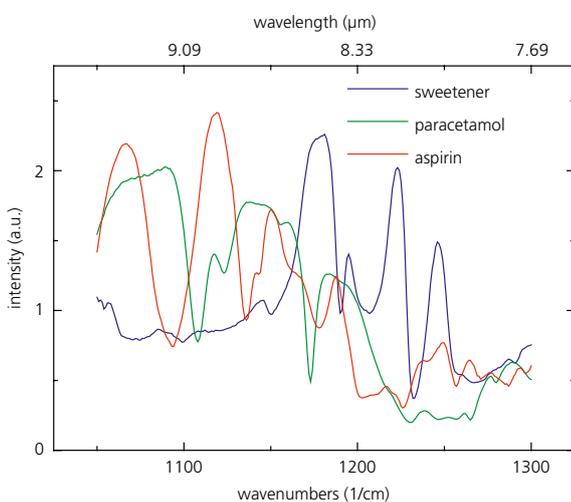
*IR laser for mobile
real-time spectroscopy.*

APPLICATION FIELDS

With our application laboratory for IR laser spectroscopy, we open up new application fields for customers and partners: In the manufacturing industry as well as in other economic sectors, our laser technology can contribute to accelerating production processes, reducing rejection rates, and saving costs.

Some application examples:

- **Process analysis:** Online monitoring of relevant chemical reactions
- **Medical diagnostics and therapy:** Breath analysis and blood glucose measurements
- **Environmental and production metrology:** Monitoring of drinking water in waterworks
- **Food production:** Identification of spoiled or sensory defective food
- **Safety and security engineering:** Detection of traces of hazardous substances or source materials of explosives



Drug or sweetener? The laser spectroscopy offers answers.

SERVICES

You would like to conduct a specific measurement or test a particular spectroscopy technique? We design customized measurement setups or configurations for you. This service e. g. includes laser systems as spectroscopic light sources for the wavelength range 4 – 11 μm , laser-based spectrometers for transmission measurements of liquids, or a laser-backscattering spectroscopy for the contact-free determination of surface contaminations.

Our service portfolio:

- **Real-time spectroscopy:** In order to secure a high quality of foods or pharma products, production processes need to be continuously monitored. Together with our partners from Fraunhofer IPMS we have developed a real-time measurement system: With our spectrally tunable QCLs, we are able to analyze a broad spectral wavelength range and identify chemical substances within milliseconds. With this »finger print« technique, Fraunhofer IAF offers a real-time measuring technique capable of performing online process control.
- **Imaging backscattering spectroscopy:** Thanks to hyperspectral imaging technology, we can create chemically selective images of a surface and detect smallest traces of contaminations. Based on quantum cascade lasers for the wavelength range of 7.5 – 10 μm , Fraunhofer IAF has developed a hyperspectral imaging sensor for the standoff detection of hazardous substances. In various projects, this sensor facilitated the detection of explosives from distances up to 25 m.
- **Liquid spectroscopy:** Up to now, liquid spectroscopy of free-flowing aqueous solutions in the deep infrared wavelength range has remained an unresolved problem. In our application lab we provide a sensing system based on a quantum cascade laser facilitating the continuous measurements for online process analyses of liquids.

PLEASE CONTACT US!

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