



PHYSIKALISCHES KOLLOQUIUM

des Fachbereichs Physik
der Johann Wolfgang Goethe-Universität Frankfurt

Mittwoch, den 11.07.2018, 16 Uhr c.t.
Großer Hörsaal, Raum _0.111,
Max-von-Laue-Str. 1



Prof. Dr. Werner Mäntele

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Abschiedsvorlesung

"Bioanalytical Infrared Spectroscopy: Quo vadis?"

Infrared (IR) spectroscopy has long been established as a routine analytical technique in chemistry, but applications for biological samples seemed impossible due to instrumental limitations such as low emissivity of thermal sources and long recording times. In addition, water as a strong absorber prevented "real" biological samples from being analysed. The introduction of Fourier transform IR (FT-IR) techniques in the 80's marks the first milestone for bioanalytical IR spectroscopy, and new techniques for the preparation of biological samples led to a rapidly growing field. FT-IR techniques are since used, as reaction-modulated difference techniques, for the analysis of biopolymers, complemented by ultrafast laser techniques. Our community has since then learnt to track and analyse individual bonds in macromolecules, their dynamics and their reactivity, from picoseconds to seconds or minutes. IR spectroscopy is now an established technique complementing structure analysis e.g. by X-ray crystallography or 2-D-NMR spectroscopy.

The advent of quantum cascade lasers (QCL) in the late nineties, powerful narrow-band single wavelength IR emitters, multi-wavelength sources, or, with an external cavity (EC), tunable EC-QCLs presents a further milestone in bioanalytical IR spectroscopy. Their power reaches to hundreds of mW and their tunability can extend over several 100 cm⁻¹, sufficiently broad to scan the entire IR fingerprint region within some msec. This opened IR spectroscopy for biomedical applications ex vivo and in vivo, for sensors and mobile devices.

The lecture presents bioanalytical and biomedical applications of IR technology at some typical examples. We will start from earlier work on the structure, function and dynamics of proteins and move to most recent developments for the analysis of body fluids in vitro and skin parameters in vivo.

Die Dozenten der Physik

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