MO 32: Experimental Techniques II

Time: Friday 14:00–14:30 Location: F 142

MO 32.1 Fr 14:00 F 142

Systematic Determination of the Complex Dielectric Response of Ionic Liquids in the Terahertz Region — •Matthias Krüger, Erik Bründermann, Stefan Funkner, Hermann Weingärtner, and Martina Havenith — Lehrstuhl für Physikalische Chemie 2, Ruhr-Universität Bochum

Ionic Liquids (ILs) are a novel class of salts with extremely low melting points that have various applications in research, synthesis and engineering. The study of intermolecular interactions in ILs is extremely interesting, as this allows for prediction and design of ILs with tailored physical-chemical properties. In principle, the complex dielectric function contains the total linear response of a molecule to an oscillating electric field and, hence, characterizes the intermolecular interactions. Especially in the terahertz region (THz, 5 cm-1 to 100 cm-1), weak interactions such as hydrogen bond dynamics of three-dimensional networks are probed. The THz measurement and data analysis of highly absorbing liquids is still challenging. We have measured the complex dielectric function of several homologous ILs with a THz time-domain spectrometer. The spectra connect well to microwave and Fourier-Transform Infrared Spectroscopy (FTIR) measurements revealing the absorption coefficient over eight orders of magnitude in a bandwidth of eight orders of frequencies. The dielectric function was measured and fitted over five orders of magnitude. A principal component analysis correlated the dielectric properties of the ILs to their structural differences and similarities.

MO 32.2 Fr 14:15 F 142

Vibrational imaging based on stimulated Raman scattering microscopy — •G. Hehl, P. Nandakumar, A. Kovalev, S. Gomes da Costa, and A. Volkmer — 3rd Institute of Physics, University of Stuttgart, Stuttgart, Germany

Based on stimulated Raman gain and loss detection, we demonstrate noninvasive point-by-point vibrational mapping of chemical and biological samples with high-sensitivity and without the requirement for labeling of the sample with natural or artificial fluorophores. A stimulated Raman scattering (SRS) microscope with near-infrared picosecond laser pulses at high repetition rates and radio-frequency lock-in detection is accomplished [1]. We experimentally demonstrate a major benefit of this technique, which is the capability to respond exclusively to the linear Raman-resonance properties of the sample, thus allowing a direct quantitative interpretation of image contrast in terms of the number density of Raman-active modes.

[1] P. Nandakumar, A. Kovalev, and A. Volkmer, New J. Phys. 11 (2009) 033026.