EXPERIMENTAL INVESTIGATION OF CONCENTRATION GRADIENTS IN MICRODROPLETS.

H. Moritz, R. Vehring and G. Schweiger; Laseranwendungstechnik, Maschinenbau, Ruhr-Universität Bochum, 44780 Bochum, Germany.

Linear Raman spectroscopy on droplet chains was used to investigate concentration gradients of chemical components in micron sized droplets. Chains of microdroplets in the size range of ~50 μm were produced by a vibrating orifice generator and passed through the focus of an argon ion laser. Raman scattering was recorded in a 90° scattering geometry by a CCD-camera mounted on a double monochromator. The microdroplets were injected into atmospheres with a chemical composition, which was in nonequilibrium with the droplet. A fast gas-microparticle reaction resulted, which produced a concentration gradient in the droplets.

Droplets were illuminated on-axis and off-axis. Alternatively morphology-dependent resonances were excited in the droplets, and spectra were taken on- and off-resonance. In both cases the differences in the internal electric field density distribution (Khaled et al., 1993) can be exploited to detect concentration gradients.

Two different systems were studied: Droplets of water were brought into a pure sulphur dioxide atmosphere (Vehring et al., 1995). Concentration gradients of dissolved SO_2 and hydrogen sulfite ions could be observed. Acetylene was dissolved in acetone and injected into a nitrogen atmosphere. The desorption process produces an acetylene gradient in the droplets.

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Khaled, E.E.M., Hill, S.C. and Barber, P.W. (1993). IEEE Trans. Antennas Propagat. 41: 295-303.

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ABSTRACTS