Raman scattering on microparticles: influence of shape distortions on size dependence.

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Assessing the potential of linear Raman spectroscopy to quantitative chemical analysis of microparticle ensembles requires a determination of the influence of size and form effects on the scattering cross section. In continuation of work performed on optically levitated particles (Schweiger 1991) we present in this paper an experimental investigation of the size dependence of the intensity of Raman scattering from microdroplets in a droplet chain. The influence of shape distortions on the excitation of morphology dependent resonances is discussed.

Chains of ethanol droplets were produced with a modified vibrating orifice generator and passed through the focal region of an argon ion laser. The intensity of the Raman scattered light was recorded by a liquid nitrogen cooled CCD camera mounted on the exit slit of a double monochromator. The size of the microdroplets could be varied in the size parameter range $100 \leq x \leq 250$. Highly monodisperse chains were produced as well as chains of particles with a controllable size distribution. A piezoelectric ceramic was used to impose different levels of noise on the microparticles in order to distort their shape.

It is shown that under the experimental conditions of this work Raman intensity is approximately linearly proportional to the number of ethanol molecules in the scattering volume if the signal is averaged over a sufficient size parameter range. Preliminary results indicate that for large particles or high noise levels the excitation of resonances is suppressed. In this case deviations from linearity can occur and effects of particle size on concentration measurements have to be taken into account.

Schweiger, G., J.Opt.Soc.Am. B 8, 1770 – 1778 (1991)

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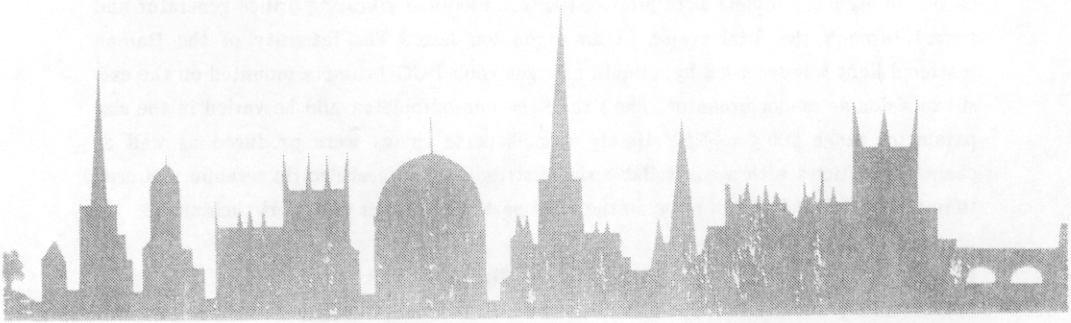

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