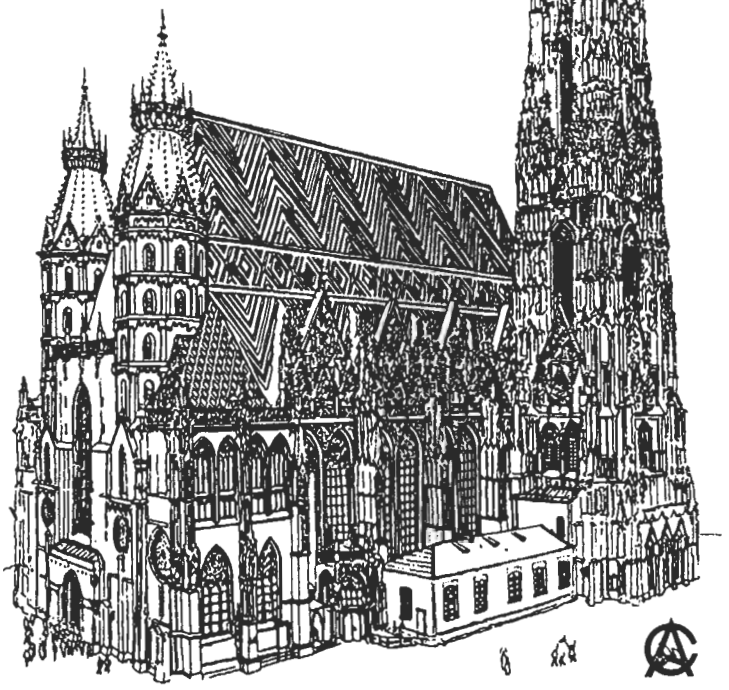
3rd International Symposium on Advanced Infrared and Raman Spectroscopy

AIRS III

July 5–9, 1998

Vienna University of Technology (Austria)



Book of Abstracts

Application of pulsed 2D-Raman Spectroscopy in Spray Research

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The evaporation of a multicomponent spray is a very complex problem especially if the components differ widely in their thermodynamic properties. In this case the droplets change not only their size but also their concentration with time, because the higher volatile components evaporate faster. In addition the gas phase concentration changes too and if the interdroplet distances are small the evaporation process is affected by the neighboring droplets. To test and improve existing complex evaporation models, the measurement of the local gas concentration as well as the measurement of the liquid concentration is necessary.
In this paper a method is presented which allows the determination of the local gas composition in the neighborhood of the droplets and the determination of the mean concentration of the various components in the droplets with high temporal and spatial resolution. The method is applied to determine the gas and liquid concentration in a chain of monodisperse microdroplets. The droplets are generated by a vibrating orifice generator. The separation of the droplets is a few droplet diameter, their velocity is approximately 10 m/s. The droplet chain is illuminated by an Ar-Ion laser. The scattered light is imaged by an appropriate lens and mirror system on the entrance slit of a double monochromator. This instrument is used to isolate the Raman bands of the various components of the liquid and the gas phase. A gated intensified CCD detector is mounted in the exit plain. The intensifier was triggered with the droplet generator. The time and duration of observation could be adjusted by a time delay generator. By choosing the appropriate delay time the observation region could be shifted relative to the droplets. This technique allowed measurement at various positions between the droplets. It is shown that with this technique the gas phase concentration can be measured with high special and temporal resolution around and in-between the droplets. In addition the mean concentration of the liquid phase can also be measured in the droplets. The technique was applied to investigate the evaporation of a jet of droplets composed of acetylene dissolved in acetone.