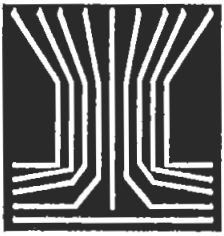
AAAR '97



Abstracts

Sixteenth Annual Conference

October 13-17, 1997

Renaissance Denver Hotel

Denver, Colorado

The American Association for Aerosol Research

RAMAN SPECTROSCOPIC CHARACTERIZATION OF ELECTRODYNAMICALLY LEVITATED MIRCOPARTICLES ORIGINATING FROM AN UNCHARGED AEROSOL

R. Vehring, R. Weber, G. Schweiger, Ruhr-Universitaet Bochum, Laseranwendungstechnik und Messsysteme, Universitaetssstrasse 150, 44780 Bochum, Germany., C. L. Aardahl, E. J. Davis University of Washington, Department of Chemical Engineering, Box 351750, Seattle, WA 98195-1750, USA.

It has been shown recently (Vehring et al, 1997) that single particles captured from a charged aerosol with an electrodynamic balance (EDB) can be identified by linear Raman spectrocopy. Here a new experimental method is presented which allows the chemical characterization of single microparticles from previously uncharged aerosols. Particles in the size range from one to ten micrometer from different artificial aerosols (TiO2, soot, DEHS) and coarse mode particles from the urban aerosol were studied. Different charging mechanisms were employed. Carbonaceous particles were selectively charged by an excimer lamp through photoemission of electrons. All other particles were charged using a dc corona charger. The particles were captured in an EDB with bihyperboloidal electrode configuration. Temperature, pressure and humidity in the EDB were the same as in the free aerosol. Raman scattering from the levitated particles was excited with an argon-ion laser and detected with a cryogenically cooled CCD sensor, which was attached to a single-stage spectrograph with an f-number of two. The spectrograph was equipped with a holographic Raman-filter for additional rejection of elastically scattered light. The particle position was monitored and controlled with a linear CCD array. The different aerosol types were identified by their Raman spectrum. DEHS particles of known size were measured to assess the detection limit. The total Raman scattering cross section was calculated as a function of particle size and used to extrapolate the measured data to smaller sizes. The DEHS particles were calibrated with photon correlation spectroscopy.

Vehring, R., Aardahl, C. L., Davis, E. J., Schweiger, G., and Covert, D. S.
Electrodynamic trapping and manipulation of particle clouds. Rev. Sci. Instrum. 68: 70-77 (1997)