MEASUREMENTS OF EXTINCTION BY AEROSOL PARTICLES USING CAVITY RING-DOWN SPECTROSCOPY AND OPTICAL FEEDBACK CAVITY RING-DOWN SPECTROSCOPY

DANIEL MELLON, JIN KIM and ANDREW J. ORR-EWING, *School of Chemistry, University of Bristol, Bristol BS8 1TS, U.K.*.

Cavity ring-down spectroscopy and optical feedback cavity ring-down spectroscopy using continuous-wave distributed-feedback diode lasers around 1.6 μm and 400 nm have been used to measure the extinction of light by samples of monodisperse spherical aerosol particles < 1 μm in diameter. A statistical model is proposed to describe the linear relationship between the extinction coefficient (α) and its variance *Var*(α). Application of this model to experimental measurements of *Var*(α) for a range of (α) values typically below 2 $\times 10^{-6}$ cm^{-1} allows extinction cross sections for the aerosol particles to be obtained without need for knowledge of the particle number density. Samples of polystyrene spheres with diameters of 400 nm, 500 nm, 600 nm, 700 nm and 900 nm were used to test the model, by comparing extinction cross sections determined from the experiment with the predictions of Mie theory calculations. The fitting method used to extract decay constants, aggregation of particles and their cloud-like motion can all provide extra contributions to *Var*(α) and are understood with the aid of computer simulations.[a]

[a] T.J.A. Butler, D. Mellon, J. Kim, J. Litman and A.J. Orr-Ewing *J. Chem. Phys. A in press (2009)*