ELECTRODYNAMIC TRAPPING OF PARTICLES ORIGINATING FROM AN UNCHARGED AEROSOL. C. L. Aardahl*, E. J. Davis, Department of Chemical Engineering, Box 351750, University of Washington, Seattle, WA 98195-1750; R. Vehring, R. Weber, G. Schweiger, Laseranwendungstechnik und Meßsystem, Maschinenbau, Ruhr-Universität Bochum, 44780 Bochum, Germany; A. Wiedensohler, Institut für Troposphärenforschung e.V., 04303 Leipzig, Germany.

This paper addresses the theoretical and experimental aspects of using an electrodynamic balance (EDB) to stably trap ambient aerosol particles which are usually uncharged or lightly charged. The problems associated with particle charging and the most effective methods of charging are examined.

Particles originating from uncharged aerosols were trapped in a bihyperboloidal EDB after they were charged by ion or electron bombardment in a uni-polar corona charger or by photoemission of electrons due to illumination by ultra-violet light. A comparatively large ac potential (11000 V pk-to-pk) was used to trap submicrometer particles or agglomerates of order one micrometer.

The particles examined include lamp black soot, graphite, sodium nitrate, titanium dioxide, and diethylhexyl sebacate (DEHS). However, particles from aerosols composed of fine primary particles were difficult to trap, which indicated a size limitation for electrodynamic trapping.

The size limit was probed using monodisperse DEHS particles produced by a condensation-type aerosol generator. By changing the temperature of the DEHS reservoir in the generator, the particle size could be altered, and the size limit could be explored. The trapping limit occurred between reservoir temperatures of 185 and 190°C. Photon correlation spectroscopy (Weber *et al.*, 1993) was used to determine the particle size as a function of the reservoir temperature of the condensation generator. A size limit of 1120 ± 40 nm was obtained for DEHS particles charged by a negative corona.

Extending the analysis of Vehring *et al.* (1997), the trapping forces could be calculated as a function of particle size. It is shown that the size limit arises because of aerodynamic drag forces resulting from convection that is present when particles are introduced to the chamber. Additional calculations show that trapping of fine particles (~200 nm) is possible provided that the particles can be charged sufficiently.

Weber, R., Rambau, R., Schweiger, G., and Lucas, K. (1993). J. Aerosol Sci. 24: 485-499.

Vehring, R., Aardahl, C. L., Davis, E. J., Schweiger, G., and Covert, D. S. (1997). Rev. Sci. Instrum. 68: 70-78.