Aerocolloidal particles have been trapped from an uncharged source aerosol using an electrodynamic balance. Graphite and soot particles were charged photoelectrically using a Xe_2 (172 nm) excimer lamp, while particles of titanium dioxide, sodium nitrate, and diethylhexyl sebacate (DEHS) were charged using a unipolar corona charger prior to injection into the chamber. It was found that the Stokesian drag force produced by convection in the balance chamber can destabilize the levitated microparticle when it exceeds the electrostatic force required to center the particle. Although the electrostatic restoring force can be increased by increasing either the particle charge or the ac field strength, charging of the particles is more difficult as the particle diameter is decreased, which gives rise to a trapping limit. Monodisperse DEHS particles were used to determine the experimental trapping limit for unipolar charging. For the experimental apparatus used in this study, a diameter of about 1 μm was found to be the trapping limit for DEHS. Results are compared to the theoretical trapping limit calculated by a force balance on a particle exposed to motion of the surrounding gas.

Key Words: electrodynamic balance; charging; fine particles; trapping.