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Surface Chemistry at Size-Selected Nano-Aerosol Particles

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A method has been developed to conduct surface chemistry and extract surface kinetic rates from size-selected aerosol nanoparticles. The measurements encompass broad ranges of particle size, phase, and composition. Results will be presented on the uptake of water by aerosolized soot nanoparticles of radius between 10 and 40 nm. Water uptake was monitored by tandem differential mobility analysis (T-DMA), which is capable of measuring changes in particle diameter as little as 0.2 nm. Soot particles were produced in an ethene diffusion flame and extracted into an atmospheric pressure aerosol flow tube reactor. The particles were subjected to various thermal and oxidative treatments, and the effects of these treatments on the ability of soot to adsorb monolayer quantities of water was determined. The results are important because soot nucleates atmospheric cloud particles. More generally, the results represent one of the first kinetic and mechanistic studies of gas-phase nanoparticle reactivity.

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