Name: Tamara Stone

Advisor: Britt Holmén

Project Title: Analyzing the Effect of Humidity on Measuring the Size Distribution of Ultrafine Particles

Abstract:

A humidification system is described to determine the effect humidity has on the measurement of ultrafine particle size distributions composed of atomized isopropyl alcohol (IPA). Either oleic acid or emery oil dissolved in IPA is commonly used in analyzing aerosols as they have similar properties to diesel exhaust. The effect that humidity has on sampling these aerosols is unknown. A standardized aerosol (SA) of IPA was created using a standardized aerosol generator developed by graduate student Terry Barrett, exposed to different levels of relative humidity and quantified using a TSI Model 3938 Scanning Mobility Particle Sizer (SMPS). The test aerosol was created by an atomizer was passed through a diluter, heater, drier and neutralizer to create a diluted aerosol that was dry and neutral in charge. The SA was then mixed with HEPA- and carbon filtered room air with relative humidity values of 6%, 22%, 48%, 69% and 95%. To determine how these different humidity levels affect the size distribution of ultrafine particles, each average particle size distribution determined from the SMPS was normalized to its maximum particle concentration and commonalities between these plots were analyzed. This information will facilitate the creation of lighter, smaller, low-cost instruments to be used for monitoring of vehicle exhaust emissions under real-world driving conditions. The creation and widespread use of such instruments will enhance understanding of nanoparticle emission processes and lead to control measures that in return improve public health.