

Characterization of Atmospheric Aerosols by Developing a Cascade Impactor

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Abstract : Micron size particles emitted from different sources and produced by combustion have serious negative effects on human health and environment. They can penetrate deep into our lungs through the respiratory system. Determination of the amount of particulates present in the atmosphere per cubic meter is necessary to monitor, regulate and model atmospheric particulate levels. Cascade impactor is used to collect the atmospheric particulates and by gravimetric analysis, their concentration in the atmosphere of different size ranges can be determined. Cascade impactors have been used for the classification of particles by aerodynamic size. They operate on the principle of inertial impaction. It consists of a number of stages each having an impaction plate and a nozzle. Collection plates are connected in series with smaller and smaller cutoff diameter. Air stream passes through the nozzle and the plates. Particles in the stream having large enough inertia impact upon the plate and smaller particles pass onto the next stage. By designing each successive stage with higher air stream velocity in the nozzle, smaller diameter particles will be collected at each stage. Particles too small to be impacted on the last collection plate will be collected on a backup filter. Impactor consists of 4 stages each made of steel, having its cut-off diameters less than 10 microns. Each stage is having collection plates, soaked with oil to prevent bounce and allows the impactor to function at high mass concentrations. Even after the plate is coated with particles, the incoming particle will still have a wet surface which significantly reduces particle bounce. The particles that are too small to be impacted on the last collection plate are then collected on a backup filter (microglass fiber filter), fibers provide larger surface area to which particles may adhere and voids in filter media aid in reducing particle re-entrainment.

Keywords : aerodynamic diameter, cascade, environment, particulates, re-entrainment

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