F-P-1

DEVELOPMENT OF A MULTIPURPOSE SAMPLER TO MEASURE HUMAN EXPOSURE TO RESPIRABLE AIRBORNE PARTICULATE MATTER

Kamal Kant Ujinwal and Tarun Gupta*

Environmental Engineering and Management Program,
Department of Civil Engineering, IIT-Kanpur
*Corresponding Author's E-mail: tarun@iitk.ac.in

Abstract

In recent years, scientists have shown that air pollution is a major cause of many respiratory diseases such as irritation of the eyes, nausea, cough, or difficulty in breathing etc. Particulate matter originates from a variety of sources, including diesel trucks, power plants, industrial processes etc. and cause air pollution. Particle pollution (especially fine particles) contains microscopic solids or liquid droplets that are so small that they can penetrate deep into the lungs and cause serious health problems. There is a need to develop an efficient multi purpose particulate air sampler which is accurate, easy to install and can provide both PM_{10} (particles less than 10 µm in diameter) and $PM_{2.5}$ (particles less than 2.5 µm in diameter) data in various micro environments. There are certain other issues like particle bounce-off, inadequate chemical and aqueous extraction, difficulties with respect to high temperature and RH and high cost that also needs attention. The aim is to develop a sampler which will address the above issues. Various parametric investigations will be carried out to develop an optimum design for the impactor. The sampler will be indigenously produced from local components to minimize cost. Once such a sampler is developed and tested for efficiency, it can be employed to sample in various microenvironments and extract important respirable PM exposure data. The chemical composition of the collected particulate matter can be determined using various chemical analysis techniques like AAS, XRF, IC, TOR etc. The schematic in Figure 1 depicts the details of the sampler. The PM_{10} and $PM_{2.5}$ impactor nozzles will be designed such that they can be used either separately or together in combination. Testing of different materials like glass fiber, quartz fiber and Teflon membrane filters will be carried out with respect to their stability with changes in temperature and RH; artifact formation due to adsorption of acidic gases; chemical reaction with collected material, pressure drop over various loading conditions and durability/ease of extraction during gravimetric and chemical analysis methods. The proposed poster will include some preliminary results from the development of this impactor.

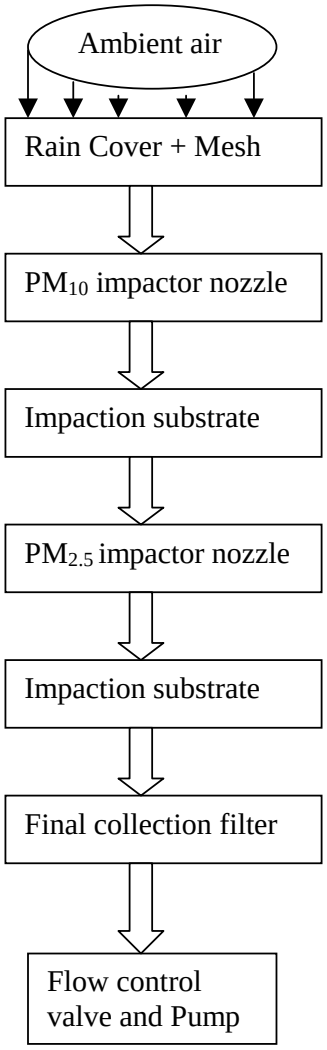

Figure 1. Schematic of proposed multi-purpose particulate air sampler.