

Personal Black Carbon Exposure Assessment: An Alternative and Low-Cost Effective Approach

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Black carbon (BC) is part of particulate matter constituents and generated from anthropogenic and natural emissions. Concerns remains over the likely outcomes on human health from exposure to BC and its association with the climate change. However, there is still little experience and low-budget for BC monitoring in resource constrained locations especially in the low-and-middle income countries (LMICs). This study aims to develop an ideal method of collecting BC data at the sequential level of concentrations for BC personal exposure characterisation. Personal air sampling pumps were used to collect filter samples on sequential loadings from 6 to 96 hours of measurement period with different filter size (25 mm and 37 mm Teflon) and sampling flow rates (1.0 LPM, 1.5 LPM and 2.2 LPM). Measurement of BC concentrations were made simultaneously using AE51 Aethalometers in the analytical laboratory in James Weir Building, University of Strathclyde Glasgow (UK). The darkness of the loaded filter samples were measured using Smoke Stain Reflectometer. A total of 6 filter samples were collected and 36 loaded samples were obtained with different loading frequency during all sampling occasions. The average percentage of darkness for all filters in this study ranged from 101.8 to 75.1%. The amount of darkness collected on all filters is decreased gradually with increased of the exposure time. The stain of filter darkness was found more prominent on the filter sampled at highest flow rate (2.2 LPM). It was found that a clear trend in filter reflectance change at the lowest loading rate measured at 1.0 LPM. The BC loading data appears to be dependent on the sampling condition at flow rate 1.0 LPM and size of filter used (25 mm). A method to assess light absorption from particulate matter is considered as an alternative procedure to give reliable and cost-effective capacities to examine BC concentrations.

Keywords: Black carbon (BC), climate change, personal exposure assessment