COLLECTION AND PHYSICAL CHARACTERIZATION OF AIRBORNE PARTICULATES

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ABSTRACT

Airborne particulates are one of the most complex air pollutants and considerable concern surrounds their environmental impact especially with regards to human health. An investigation on the efficiency of various total inhalable and respirable dust samplers has been conducted to identify the most convenient way of collecting dust particles to examine their physical characteristics. The efficiency of a variety of dust samplers were investigated using limestone dust clouds generated inside an environmental dust chamber. Various sampling periods were employed to establish dust concentrations in the environmental dust chamber. The experimental dust cloud was found to contain on average 55.74 % of respirable dust as defined by different instruments while a consistent dust concentration of approx 200 mg/m^3 was repeatedly produced.

The methods for collecting and estimating airborne asbestos fibre concentrations were studied and found to be extremely limited. Standard optical techniques grossly underestimated both airborne fibre concentrations and respirable dimensions of fibres. The size and dimensions of respirable asbestos fibres are defined by their ability to gain access to the lungs and there is no instrument or technique available at present, which will allow collection and estimation of respirable fibrous dust clouds. A comparison of coal dust particles with similar particles retained in the lungs has shown a difference from the predicted respirable fractions as proposed by the British Medical Research Council (BMRC) and other conventions. Respirable dust sampling instruments may therefore be more suited for sampling larger particles.

The difficulty in estimating the characteristics of airborne particulate material has been demonstrated by illustrating urban particulate collection and analysis. The extremely large differences in terms of physical size, and aerodynamic properties of dust particles formed by different materials have been demonstrated.

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