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Large scale air monitoring: lichen vs. air particulate matter analysis

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Abstract

Biological indicator organisms have been widely used for monitoring and banking purposes for many years. Although the complexity of the interactions between organisms and their environment is generally not easily comprehensible, environmental quality assessment using the bioindicator approach offers some convincing advantages compared to direct analysis of soil, water, or air. Measurement of air particulates is restricted to experienced laboratories with access to expensive sampling equipment. Additionally, the amount of material collected generally is just enough for one determination per sampling and no multidimensional characterization might be possible. Further, fluctuations in air masses have a pronounced effect on the results from air filter sampling. Combining the integrating property of bioindicators with the world wide availability and particular matrix characteristics of air particulate matter as a prerequisite for global monitoring of air pollution is discussed. A new approach for sampling urban dust using large volume filtering devices installed in air conditioners of large hotel buildings is assessed. A first experiment was initiated to collect air particulates (300–500 g each) from a number of hotels during a period of 3–4 months by successive vacuum cleaning of used inlet filters from high volume air conditioning installations reflecting average concentrations per 3 months in different large cities. This approach is expected to be upgraded and applied for global monitoring. Highly positive correlated elements were found in lichens such as K/S, Zn/P, the rare earth elements (REE) and a significant negative correlation between Hg and Cu was observed in these samples. The ratio of concentrations of elements in dust and *Usnea* spp. is highest for Cr, Zn and Fe (400–200) and lowest for elements such as Ca, Rb, and Sr (20–10).

Keywords

Air pollution monitoring;
Lichen;
Air particulate matter;
Global monitoring