AEROSOL FILTER ANALYSES USING SCANNING MICRO X-RAY FLUORESCENCE

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Trace element detection of aerosol deposits on filters is an important analytical capability. Much of the analyses currently done on filters use bulk detection methods such as XRF, ICP and NAA. XRF has limited sensitivity due to the area being analyzed with a large excitation beam. The ICP requires the filter and aerosol to be dissolved, which prevents additional analyses to be done on the sample. While arguably the most sensitive for many elements, research reactors with NAA facilities are not readily available to most researchers. Other approaches utilize multiple point analyses which provide small area characterizations, but miss most of the filter area and assume the composite multipoint is representative of the entire filter. This work explores the use of micro X-ray fluorescence (MXRF) scanning of a filter to characterize the aerosol deposits. The filters used in this study are aluminum substrates, 47 mm in diameter. A 50 micrometer x-ray beam spot size is used to scan a 27 mm diameter area with a 100 ms dwell time. Although the data acquisition takes approximately 11 hours to cover the entire filter, the limits of detection approach 10 nanograms. This is a significant departure from routine filter characterization approaches. The use of the MXRF enables particulate detection calculated to be less than 10 micrometers. Details on the scanning methodology, elements detected, sensitivity and areas for increasing sample throughput will be discussed.