

## Field-Flow Fractionation-ICP-MS Characterisation of Workplace Aerosols

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There is growing concern about the adverse health effects on workers exposed to airborne particles. An example is the “fume” generated during metal processing, welding and cutting operations. The size of such aerosol particles is of vital importance in determining the transport and fate of such particles in the respiratory system.

The separation aspect of FFF can be exploited to obtain detailed chemical characterisation as a function of particle size [1]. This is achieved by utilising appropriate analytical techniques to analyse the size fractions generated. Methods such as SEM, TEM, EDX, XRD, scintillation counters and AAS have been tested. Inductively coupled plasma-mass spectrometry (ICPMS) has proved to be an ideal detector for FFF. FFF-ICPMS began around 1990 [2]. ICP-MS has the high sensitivity required for the very dilute samples delivered by FFF, it is capable of simultaneous multielement analysis and can be coupled online to produce continuous element distributions of the sample [3].

To test the new FFF-ICP-MS methodology a set of aerosol samples have been collected on filters and then dispersed in surfactant solution. Sedimentation FFF runs were done and size distribution computed. SEM images have been obtained for three fraction across the distribution to verify the sizes. FFF-ICP-MS data have also been collected and the elemental distributions were obtained. The new hyphenated method of FFF-ICP-MS is capable of producing size based speciation data of unprecedented resolution that should be useful in monitoring workplace aerosols and assessing their effects on human health.

[1] Schimpf, M. E., Caldwell, K. D. and Giddings J.C. (2000) *Field-Flow Fractionation Handbook*, John Wiley NY.

[2] Taylor, H.E., Garbarino, R., Hotchin, D.M. and Beckett, R. (1992). Inductively Coupled Plasma-Mass Spectrometry for Use as an Element Specific Detector for Field Flow Fractionation Particle Separation. *Analytical Chemistry*, 64, 2036-2041.

[3] Ranville, J.F., Chittleborough, D.J., Shanks, F., Morrison, R.J.S., Harris, T., Doss, F. and Beckett, R. (1999). Development of Sedimentation Field-Flow Fractionation-Inductively Coupled Plasma Mass-Spectrometry for the Characterisation of Environmental Colloids. *Analytica Chimica Acta*, 381, 315-329.