

## OC and EC determination in aerosol samples collected on Teflon filters by Particle Elastic Scattering Analysis (PESA) and Ion Chromatography (IC)

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Ion beam analysis (IBA) techniques have proven to be a reliable tool to study the composition of atmospheric aerosol in a fast, non-destructive way. In particular, Particle Induced X-ray Emission (PIXE) is widely used to determine the aerosol elemental composition, simultaneously detecting elements from Na to Pb. Less used, Particle elastic scattering analysis (PESA) technique detects the beam particles elastically scattered by the target nuclei and allows obtaining quantitative information about the elemental composition of the sample as regards low Z atoms like C, H, N and O (Chiari et al., 2005). By IBA techniques (PIXE and PESA) it is possible to obtain a complete reconstruction of the aerosol mass for samples collected on Teflon filters.

If particulate matter is simultaneously collected on Teflon and on Quartz fibre filters, the application of complementary techniques allows a quite complete mass closure and chemical characterisation: Teflon filters can be analysed by PIXE and IC to measure the elemental and ionic composition, while quartz fibre filters can be used to determine EC and OC by thermo-optical-transmittance (TOT) analyses. This approach has been extensively used by the authors, and, in particular, it has been applied in the PATOS project, the first extensive field campaign for the PM10 characterisation in Tuscany.

However, it is not always possible to collect the aerosol by two samplers simultaneously for long periods. When only Teflon filters are used EC and OC can not be measured by TOT analysis. We will show that by the use of PESA and IC it is possible to approach this problem.

The measurement of Nitrates and Ammonium by IC allows calculating the H content in these compounds: subtracting this contribution to the total H concentration, measured by PESA, it is possible to estimate the H content in the organic compounds ( $H_{\text{POM}}$ ). If the OC/H ration in organic matter, which is characteristic of the sampling region and sampling season, is known, the OC concentration can be thus estimated. The EC concentration can be then obtained subtracting the OC contribution to the TC, measured by PESA.

To verify the reliability of this procedure, we used samples collected in parallel on both Teflon and Quartz fibre filters, in different typology of sampling sites (urban background, urban traffic and regional background) and during different seasons. These samples have been analysed by PESA, IC and TOT (NIOSH5040) to determine the H, C, Nitrate, Ammonium, EC and OC concentrations to investigate the OC/ $H_{\text{POM}}$  ratio for the different sampling sites/periods and to verify the accordance between the estimated and the measured EC. The obtained results, that indicate a quite stable OC/ $H_{\text{POM}}$  ratio for each site, will be described in detail.

The improvements in PESA analysis accomplished with the new Tandem accelerator of LABEC-INFN will be also illustrated: in particular we will show that H can be easily measured on a large number of samples, simultaneously with PIXE (in the same external beam set-up). The results of the first inter-comparison between PESA and TOT analyses for TC measuring will be also presented (Figure 1).

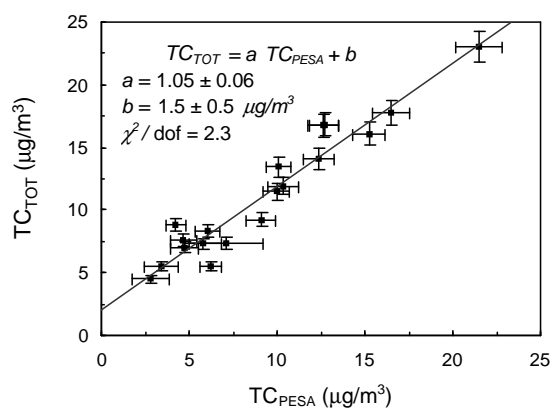


Figure 1. Inter-comparison between PESA and TOT analyses for TC measuring.

M. Chiari, M. Lucarelli, F. Mazzei, F. Nava, S. Paperetti, L. Prati, P. Valli, G. Vecchi, R. (2005), *X-Ray Spectrometry*, 34, 323.