

X-rays Analytical Techniques for Determining Trace Elements in a Single Human Hair and Atmospheric Aerosols

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X-ray fluorescence (XRF) analysis is useful for determining trace elements in various samples. Total reflection X-ray fluorescence (TXRF) analysis has been applied to measure the ultra-trace elements in solution sample such as, red wine, river water and drinking water. In this study, we developed new sample preparation methods for determination trace elements in a single human hair and aerosol particle in the atmosphere by using X-ray trace analytical technique.

To determine trace elements in a single hair sample, XRF analysis was applied. The standard material of human hair (CRMs No.13 (National institute for Environmental studies, Japan)) was prepared to obtain a calibration curve. Several standard materials of different weights, weighed by microbalance UMX2 (Mettler toledo, Ltd, Japan), were placed onto the mylar films. The prepared materials (several tens μg) were measured with desktop-type EDXRF (Energy dispersive XRF) instrument. And then, we obtained the relationship between Zn weight and net intensity of Zn $K\alpha$ peak. The net intensity was direct proportional to Zn weight (μg). Since the weight of a single human hair with length of approximately 5 mm is several tens μg , it will be possible to determine Zn weight in a single human hair sample.

TXRF analysis was used for determining metal elements in the aerosol particle. Aerosol particles were collected by membrane filter and cascade impactor. The filter that collected aerosols was placed onto the sample carrier. However, because thin type X-ray beams for TXRF analysis are irradiated to sample, it is difficult to measure the total amount of filter paper containing aerosols. Therefore, in this study, to prepare a thin film-like residue, the aerosol correction filter on the sample carrier was dissolved with an acetone solution. The net intensity of XRF is improved by dissolving filter paper with acetone.