ASSESSING THE ENVIRONMENT WITH X-RAY FLUORESCENCE

J. Boman[1], J. B. C. Pettersson[1], M. Gatari[2], A. Wagner[3], P. Molnár[4]

[1]*Department of Chemistry, Atmospheric Science, University of Gothenburg, SE-412 96 Gothenburg, Sweden.* ***johan.boman@chem.gu.se***
[2]*Institute of Nuclear Science & Technology, University of Nairobi, P.O. Box 30197-00100, Nairobi, Kenya*
[3]*Department of Applied Physics, Chalmers University of Technology, SE-412 96 Gothenburg, Sweden*
[4]*Department of Occupational and Environmental Medicine, Sahlgrenska University Hospital & University of Gothenburg, Box 414, SE-405 30 Gothenburg, Sweden*

Trace elements are important for the environment and also for human health. To study the distribution of trace elements in the environment and determine reasons for concentration changes and to estimate the possible consequences are challenging task for researchers of many research disciplines. The multi element capacity, flexibility and low detection limits makes the X-ray fluorescence technique an excellent tool for the study of the elemental composition of environmental samples.

Many different X-ray fluorescence techniques can be utilized in the environmental studies. In one end of the spectrum we have large scale facilities to study small scale samples, i.e. synchrotrons around the world with beam lines devoted to µXRF studies, in some cases in combination with µXAS and µXRD. Many authors have used the µXRF technique to study the spatial distribution of both toxic and essential elements in different materials, in many cases plants have been in the focus of interest. In the other end of the spectrum we have the small handheld spectrometers enabling XRF studies in the field, without the need to bring samples to a laboratory. The handheld instruments, or portable if we go up in dimension, are suitable for environmental investigations of for example contaminated land areas and deteriorated surfaces where the analysis can be linked to the influence on our cultural heritage as well.

As illustrated above, the area on environmental applications of XRF is immense, and we will therefore focus on the analysis of the elemental composition of airborne particulate matter. Aerosol particles can be seen as a link between many of the other areas, since they may influence the environment on a local, regional and global scale. In the urban environment the analysis result of the particles can be combined with knowledge about local climate as well as larger meteorological movements that are used to determine possible sources or source regions of the different elements in the collected aerosol particles. In studies in Nairobi, Kenya and in Gothenburg, Sweden, (Boman, Gatari, Wagner et al.) both local activities as well as long range transported (LRT) pollution was identified as contributors to the air quality of the cities. In Skopje, FYR of Macedonia, (Kovacevik et al.) LRT particles were also identified, together with signs of local sources such as combustion processes and industrial activity. In studies by Molnar et al. links between the particulate matter outdoors, indoors and possible health implications showed differences between the behavior of different elements and in Beijing Sun et al. looked at the composition of individual particles in the preparatory work before the Olympic Games in Beijing 2008.