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## Characterization of Work Environment Aerosols by PIXE

Bohgard, Mats; Johansson, Gerd; Malmqvist, Klas; Akselsson, Roland

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LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00



# 110361, CHARACTERIZATION OF WORK ENVIRONMENT AEROSOLS BY PIXE

M. BOHGARD, G. JOHANSSON, K. MALMQVIST and K. R. AKSELSSON.

Department of Nuclear Physics, Lund Institute of Technology,  
Sölvegatan 14, S-223 62 Lund, Sweden.

There is an increasing research interest in the field of the health effects of airborne particulate matter. In several work environments high aerosol concentrations can be measured. It is of major importance to have a good characterization of the aerosol when estimating the health hazards and when developing elimination techniques and monitoring routines. A characterization is also essential when taking work environment into consideration in the development of new production techniques. The interesting features of an aerosol are the particle concentration, the particle size distribution and the chemical composition of the particles.

PIXE (Particle Induced X-ray emission analysis) offers unique opportunities to perform extensive studies of the elemental composition of different particle size fractions. Size-fractionated samples from a modified Battelle impactor are analyzed with PIXE on a routine basis (less than 4 minutes/sample) giving quantitative results for all elements heavier than argon with detection limits in the order of 1 ng.

With support from the Swedish Work Environment Fund studies of fume from several welding operations have been performed. Fume from some metal spraying techniques has also been investigated. Welding fumes often contain high concentrations of fluorine, which is a too light element for PIXE but an important element in health hazard assessments. Fluorine is analyzed simultaneously with PIXE-analysis by detecting the  $\gamma$ -rays from the  $^{19}\text{F}(p,\alpha\gamma)^{16}\text{O}$  reaction. The detection limit is about 50 ng.

The fumes from stainless steel welding and some metal spraying methods often contain high chromium concentrations. The health effects are depending on the oxidation state of the chromium and the solubility of the chromium compounds. We have developed a procedure, including PIXE, ESCA and TEM, which under certain conditions gives information about oxidation state and solubility.

About 15 elements have been detected in the welding and metal spraying fume studies. In general particles generated by welding, are respirable ( $< 2 \mu\text{m}$  aerodynamic diameter). Fume from metal spraying often contains a non-negligible respirable fraction. The elemental composition and oxidation state of chromium is depending on the method and the conditions of the process.