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## PIXE Analysis of Environmental Samples

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# 11 0362, PIXE ANALYSIS OF ENVIRONMENTAL SAMPLES

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Particle induced X-ray emission (PIXE-)analysis constitutes a
fast reliable method for multielemental analysis with low detection limits.
The method is especially suited for small samples (1 μg - 1 mg total mass).
Its mass calibration is checked within a minute or two. The possibility of
simultaneous applications of other nuclear techniques for the analysis of
lighter elements extends the merits of PIXE for some types of environ-
mental samples considerably.

At our laboratory routinely 2.5 MeV protons are used to induce X-rays,
which are detected in $135^o$ in a 80 $mm^2$ Si(Li)-detector. Work is in pro-
gress to optimize the arrangement and the parameters for simultaneous PIXE
and low Z backscattering analysis. A sample typically requires 1 - 4 min-
utes for analysis. Before and after the analysis of every container hold-
ing 40 samples, a two-element standard is run. The arrangement is very
stable and the results of the standard runs are routinely reproducible at
the 5 % level.

The PIXE method is well suited for studies of elemental composition of air-
borne particulates. Due to its capability to analyse small samples, small
and convenient samplers may be used. Due to its speed and low cost many
samples may be analysed. Thus PIXE offers the possibility of good time,
size and site resolution. These features will be illustrated by results
from two investigations performed in Sweden. In the first of them a 6-
stage single orifice cascade impactor was used. It was e.g. found that air
masses coming from the south-west contained 10 to 30 times more of the
antropogenic small particle elements sulfur, lead and copper than those
coming from the north-west. In the second investigation a sampler of a
special continuous time sequence design (J.W.Nelson, Dept of Physics, FSU,
Tallahassee) was used. This filter sampler gives a time resolution of
about 2 hours and a sample from more than one week is contained in a 5 mm
wide and about 170 mm long streak.
Detection limits for trace elements in e.g. sea and rain water below the
0.1 ppb level are obtained by using a technique involving complex-binding
and adsorption on activated carbon.