ABSTRACTS

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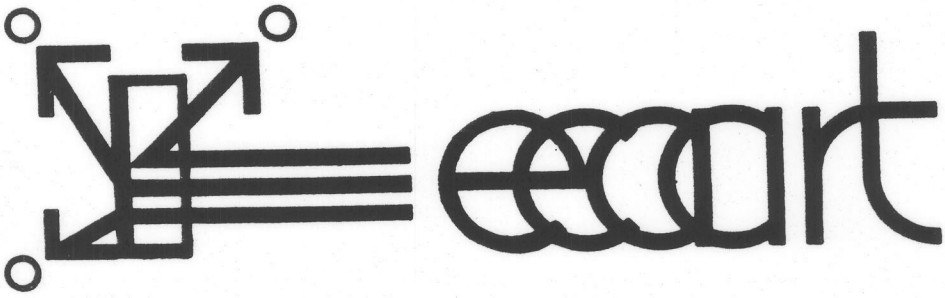

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MICRO-PIXE STUDIES OF MINERALIZED TISSUES - A QUANTITATIVE APPROACH

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In quantitative micro-PIXE analysis of mineralized tissues (cartilage, bone, tooth) several problems have to be overcome. The thickness and contents of main elements (H, C, N, O, P, Ca) of the sample at each irradiated point are not only unknown but vary from point to point. The number of irradiated points for one sample makes fitting of the spectra as well as calculations of the matrix correction factors (MCFs) at each point practically impossible. A separate problem deals with the thermal damage of the sample, which may also be point-dependent effect. The aim of the present studies was a detailed description of the procedure suitable for quantification of micro-PIXE measurements of mineralized tissues.

Taking into account precision, accuracy and systematic errors of the analysis as well as computation time, the following procedure turned out to be the best among the tested approaches. PIXE and RBS spectra were measured at each point. An assumption was made that the sample is composed of hydroxyapatite (HAP) and collagen (COL), i.e. the contents of the main elements in the sample are described by HAP/COL ratio. At each point the HAP/COL ratio and thickness of the sample were extracted from RBS spectra. The RBS spectra were also used for self test of the procedure. For determination of trace element contents the calculations of absolute concentrations in conjunction with an external standard were applied. The MCFs of various elements were approximated by least-squares fitting of an analytical function of the thickness and HAP/COL ratio to the calculated values. The influence of the thermal effects on the determined concentrations were both calculated and measured. The procedure was tested in the broad PIXE measurements using the set of model compounds with well known composition. The examples of the application to investigations of bone samples are also presented.

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Hydride Ambiguities in the Accelerator Mass Spectrometry (AMS) of Heavy Elements

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Abstract

Accelerator mass spectrometric Methods have been used in a survey to study atomic negative ions. The study revealed the existence of copious and fragile hydride negative ions that spontaneously fragment to neutral and negatively charged constituents. Some hydride fragments create ambiguities that can mimic the elemental ion of interest, and can be eliminated only if adequate resolution is available during the post acceleration phase of AMS. An overview of this phenomena will be presented in this paper.