



Computational Analysis of PIXE Spectra for Enhanced Elemental Identification



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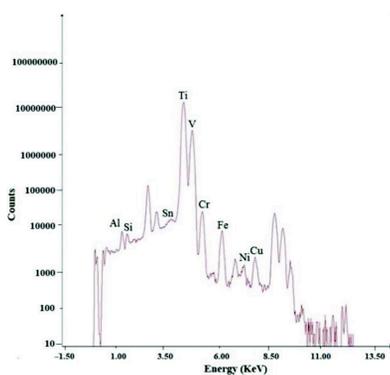
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Abstract

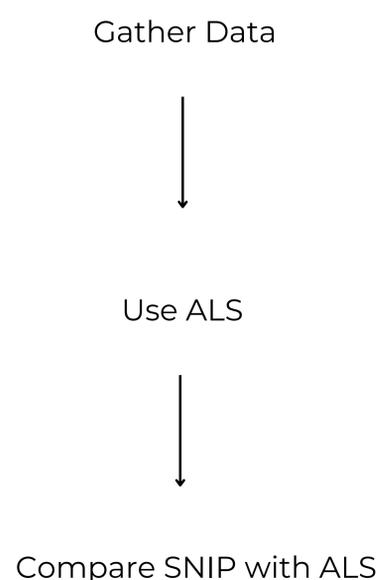
Particle-Induced X-ray Emission (PIXE) is a widely used technique for elemental analysis, where x-rays emitted from a sample upon proton bombardment provide characteristic signatures of specific elements. One of the general approaches for analyzing PIXE spectra is computational processing, which allows for precise identification of elemental composition. In this study presents a computational approach for analyzing PIXE spectra and evaluates its accuracy by comparing the results with established research databases. Preliminary findings reveal discrepancies, including mismatched x-ray energies for certain elements and cases of undetected elements. Consequently, improvements in spectral processing techniques are being explored to enhance element identification and increase compatibility with other PIXE analysis softwares.

Introduction

Particle-Induced X-ray Emission (PIXE) is a powerful technique for elemental analysis, widely used in materials science, environmental studies, and biomedical research. This study focuses on the application of advanced baseline correction and peak fitting techniques to enhance the accuracy of micro-PIXE spectral analysis. Two baseline correction methods, SNIP (Statistics-sensitive Nonlinear Iterative Peak-clipping) Algorithm and IASLS (Improved Asymmetric Least Squares), are applied to preprocess the spectrum. Gaussian smoothing is used to reduce noise, and peak detection algorithms identify characteristic X-ray emission lines. This approach enables precise identification of elements such as Al, Si, S, Cl, Ar, K, Ca, and Fe, improving the reliability of quantitative analysis. The results contribute to advancing automated spectral interpretation, benefiting various scientific and industrial applications.



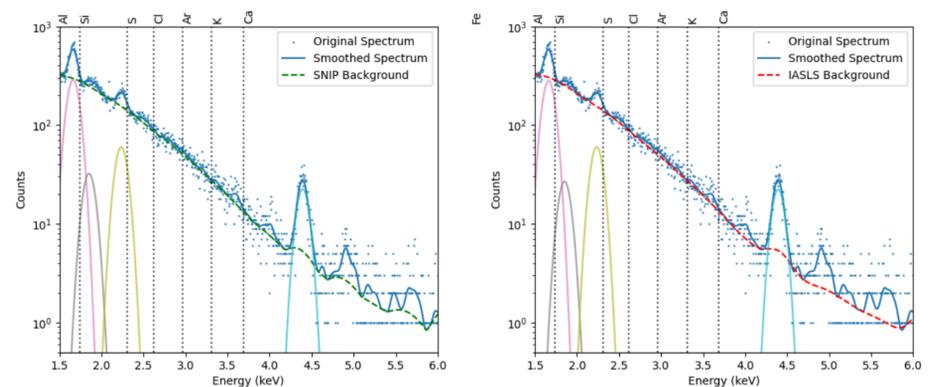
Methodology



Objective

- Analyse element by using Asymmetric Least Square (ALS) with Python
- Compare ALS with SNIP algorithm

Results and Discussion



- SNIP and ALS have a little different in background estimate
- Need to improve furthermore in computational development