

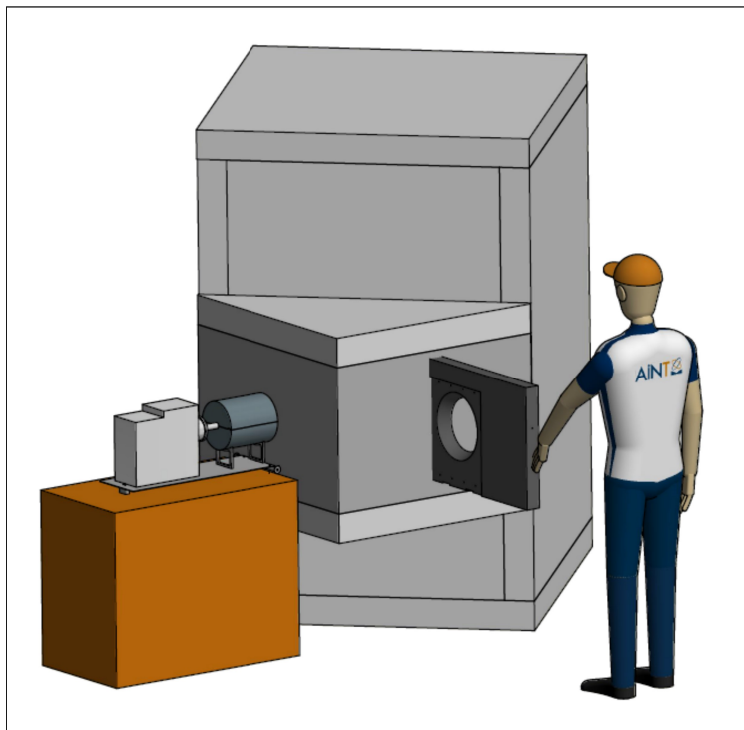
Detection of Heavy Metal Content in Environmental Samples through Neutron Activation

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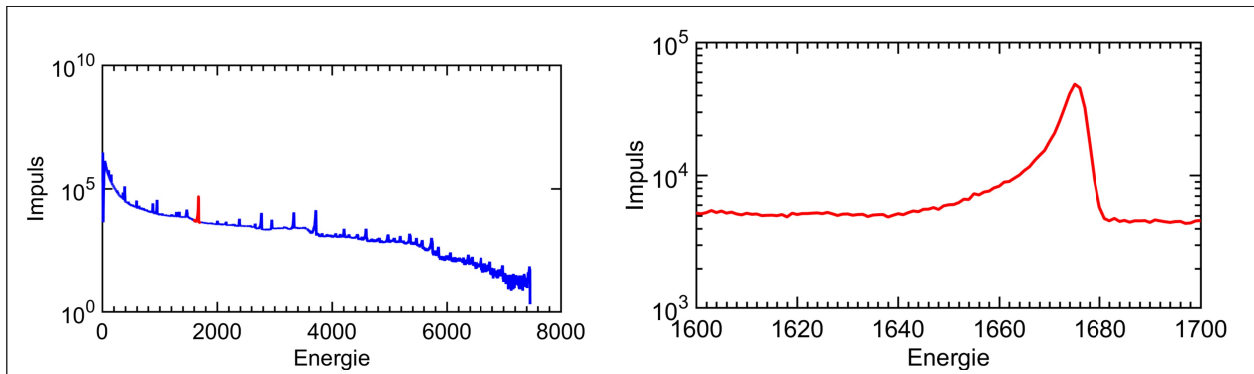
Increasingly strict limits for contaminants and heavy metals in environmental samples of soils, water and feedstock require fast and precise Analysis methods that can provide information on their elemental compositions. One such new method is Prompt-Gamma-Neutron-Activation-Analysis (PGNAA).

In the frame of a joint research project with RWTH, AiNT currently develops a measurement facility for the analysis of environmental samples based on this method. In the procedure, the sample is placed inside a test chamber and then irradiated with neutrons. The different sample's nuclei absorb the neutrons and become excited. Shortly afterwards the atoms return to their ground level and emit



Prompt-Gamma-Neutron-Activation-Analysis Device

a gamma photon with energy characteristic of the element. This photon is then measured with a detector and from its intensity and energy it is possible to recognize and quantify the amount of an element in a sample. The data recovered by the detector is a very complex Gamma-spectrum, for which an automatic analysis process is desired. For this, it is indispensable to be able to compare two different spectra in order to perform a first classification (according to different parameters such as Humidity, Sample Type etc.) and facilitate further analysis. Also the detection of special features of a spectrum and the evaluation of differences to the spectrum of well known reference materials can provide valuable information for a comprehensive analysis process. The task to solve is then: The comparison, detection and description of differences between two spectra.



Left: Full Spectrum. Right: Expanded view of selection (red)

Problem:

- * How to compare two different Gamma Spectra?
- * How can their differences be discerned and described?
- * What is a measure for the match / discrepancy between two Spectra?
- * Is it possible to sort / classify the Spectra into groups?
- * If that is the case how are such groups created and what do their members have in common?