

Session 4: NORM in building materials

Poster presentation

Continuous wavelet transform in the analysis of gamma-ray spectra with NORM

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Problem formulation

In recent years, following the increasing data processing capabilities available, new algorithms and approaches have evolved for gamma-ray spectra analysis. Use of continuous wavelet transform (CWT) has emerged as a tool for analysis of various kinds of spectroscopy data. Its performance applied to NORM gamma-ray spectra was studied.

Methods

In this work, a set of about 300 gamma-ray experimental spectra routinely acquired at IPEN's environmental radiometrics laboratories, highly peak-populated and with significant overlap generating multiplets needing deconvolution, was analyzed, in order to verify the performance of the CWT algorithmic technique for the specific set studied. In common, those spectra have high counting rates of gamma-ray from several radionuclides in the natural decay series of uranium and thorium, giving rise to a complex base line and with several overlapping peaks. Such features tend to generate, in the analysis process, a high rate of false negative photopeaks, especially when within the multiplets, for common analysis techniques.

Another common feature is that the baseline tends to have discontinuities along the spectra, most frequently on each side of prominent peaks, due to scattering processes contributing only to the lower energy side.

Conclusion

With current computational resources typically available, like a single computer with i5 processor and 8 GB RAM, the analysis of the whole spectra set took about 5 minutes, demanding only an initial parameter setup in order to determine optimal values for the wavelet function employed, for the spectra set measured in each particular spectrometry system, composed by the HPGe detector, associated electronics, counting geometry and shielding, with no need of frequent subsequent readjustments.

We concluded that use of CWT function in large sets of homogeneous gamma-ray spectra, is adequate in such automated analysis.