

Evaluation of Peak Fitting Software for Magnesium quantification by INAA

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The selection of peak fitting software for gamma spectrum analysis is important for accurate determination of mass fraction of element, particularly, multiple peaks interfered in the spectrum. Several peak fitting softwares are available, however only selected software are suitable for accurate mass fraction of the element. Previously, IAEA conducted the inter-comparison study to identify the better program for gamma spectrum analysis [1,2]. Most of the programs were able to obtain similar peak areas for a single peak when using the program's default settings, but multiple peaks gave different results between programs. However, some of programs using user defined settings (FWHM, peak position, and peak area) were produced better results for multiple peaks analysis. In this case, the end user needs expertise in gamma spectrum analysis to get the peak area properly. In the example of multiple peaks, ²⁷Mg (θ : 11%, $T_{1/2}$:9.46 m) emits the 843.76 keV (α : 71.8%) and 1014.43 keV (α : 28.0%), and interfere with 841.58 keV (α : 14.2%) of ^{152m}Eu (θ : 47.8%, $T_{1/2}$:9.312 h) and 846.81 keV (α : 98.85%) of ⁵⁶Mn (θ : 100%, $T_{1/2}$:2.579 h) peaks (Fig.1). The 1014.4 keV of ²⁷Mg is subject to large uncertainty due to poor counting statistics. Thus, it is necessary to identify the suitable programs to deconvolution of multiple peaks for somewhat consistent results of Mg quantification using 843.76 keV gamma peak. In the present study, accurate quantification of Mg was carried out using various popular peak analysis programs, GammaVision, Genie2000, HyperLab, and HyperGam, and applied various CRMs and environmental samples. Mg concentrations was determined using k_0 -INAA method using KayWin program included the isotopic interference correction from ²⁷Al(n,p)²⁷Mg with simultaneous determination of Al content. We have applied and compared several cases with different ratios of the corresponding peaks and it is expected that it can be applied to various interference peaks based on the results of this study.

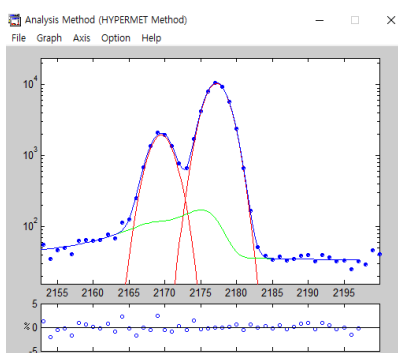


Fig. 1. Doublet peak deconvolution at 843.76 keV (²⁷Mg) and 846.81 keV (⁵⁶Mn) by HyperGam program.

References

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2. B.-G. Park et al., New development of hyperGam and its test of performance for γ -ray spectrum analysis, *Nucl. Eng. Technol.*, 44 (7), 2012, 781-790.