Introducing a New HPGe γ-ray Spectrum Analysis Software

Chang Su Park[a] and G.M. Sun[b] and H.D. Choi[a]
[a]Seoul National University, Sillim-dong, Gwanak-gu, Seoul 151-742, Korea, vandegra@plaza.snu.ac.kr
[b]Korea Atomic Energy Research Institute, Deokjin-dong, Yuseong-gu, Daejeon 305-353, Korea

1. Introduction

On the analysis of γ-ray spectrum, the interactive user input-parameters must be minimized to reduce human errors. The HYPERMET [1], which was coded for automatic and efficient analysis of the complex spectrum from high-resolution germanium (HPGe) detectors, had been developed in 1970's and modified to use PGAA [2]. Recently, HyperGam, a new MS-Windows version of HPGe γ-ray spectrum analysis software with graphical interface, has been developed based on the original.

2. Peak Fitting Function

The semi-automatic analysis algorithm for γ-ray peak is adopted from the previous code. The peak fitting is performed by using the empirical formula composing of a Gaussian, two exponential tail terms and complex background functions. Each component resembles the mechanism of peak formation on the spectrum. The summation of these formulas enables to decompose multiplet peaks. The peak fitting result is like that shown in figure 1.
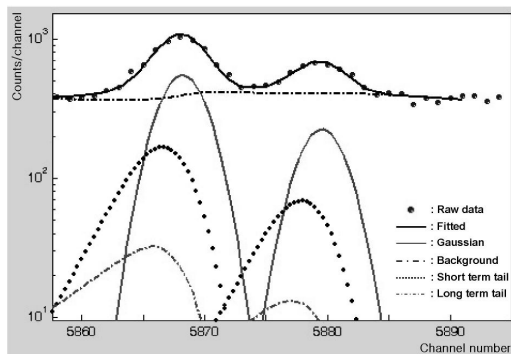

Figure 1. The fitting of peaks on analysis process.

3. Features of HyperGam

The main operation environment was developed in MATLAB to provide convenient graphic user interface and run on the PC-Windows system. It was compiled with including the peak analysis part rewritten in C language. Figure 2 shows the HyperGam code running. The functions of interface part is to import spectrum files, display spectrum and set the minimum input parameters. The user input is only the initial width of the peak for fitting. The advanced option parameters of analysis can be modified. In the analysis process, the

details of peak fitting result are graphically displayed for user's check. In the result, the position, area and width of each peak are given.
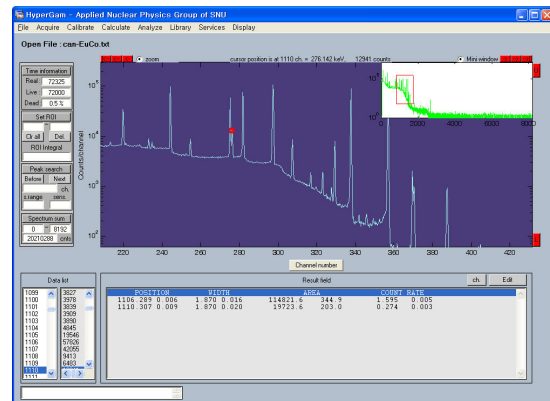

Figure 2. The main window of the HyperGam.

The routines for other peak analysis methods, of Debertin and OMNIGAM, were added. The Doppler-broadened peak analysis routine was included for the boron analysis in PGAA [3]. The channel-energy calibration is considered with system non-linearity.

4. Conclusion

The HyperGam, a versatile gamma-ray spectroscopy program, has been developed for MS-Windows with graphic user interface. It provides a comprehensive environment for the analysis of HPGe γ-ray spectra and is widely applicable in γ-ray spectroscopy.

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