

Peak Shape Fitting Function Comparison for Air-borne Detection Spectrum

Si Hyeong Sung, Hee Reyoung Kim

Ulsan National Institute of Science and Technology, Ulsan 44919, Republic of Korea
*E-mail: shlove912@unist.ac.kr

Keywords: PIPS Detector, MCNP6 Modeling, Fitting Function, Spectroscopy

Low-tailing due to energy loss in the alpha spectrometer causes peak overlapped and deconvolution. In order to minimize energy loss, the spectrum measurement is carried out through vacuum or pre-treatment, but the measurement in air must be calibrated separately. In order to correct the count of each nuclide in the resulting spectrum, a fitting function technique is used. MCNP modeling of the airborne alpha measurement system was performed, and accuracy was compared by applying three Gaussian-based fitting functions to the result values. Fig. 1 shows the results of applying the fitting equation ^{220}Rn progeny spectrum.

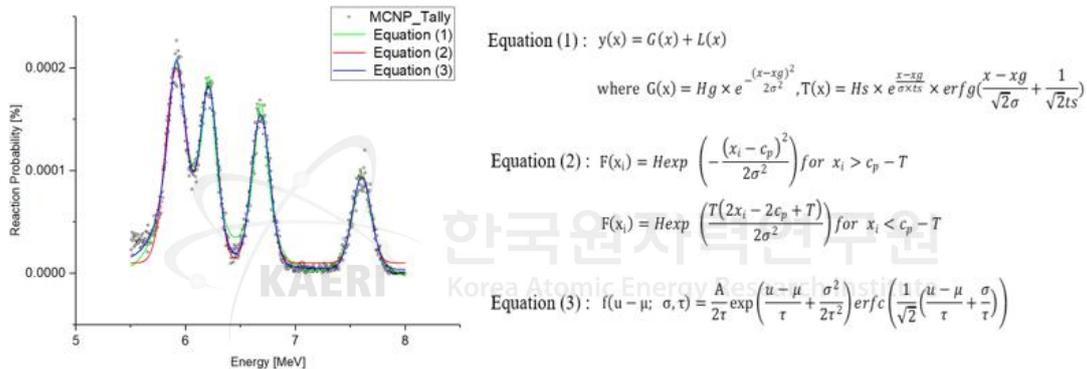


Fig. 1. Fitting functions applied to ^{220}Rn , ^{216}Po , ^{212}Bi , ^{214}Po [1,2]

The accuracy of fitting was confirmed by comparing the (RMS Root Mean Square) value with the reduced chi-square value. Applying equation (3) for the ^{220}Rn progeny alpha spectrum, the RMS value was 0.982 and the reduced chi-square value was 6.34E-11. It shows 1.2 % better accuracy than other fitting features. When applied to spectra derived in real-world monitoring, greater accuracy differences are expected, depending on the degree of overlapping peaks. It is expected that the peak correction according to the environment can improve the real-time alpha measurement accuracy.

Acknowledgments

This work was supported by the 'Development of Portable Radioactive Contamination Monitoring System for Alpha and Beta Dust Source in the Air' of the Korea Institute of Energy Technology Evaluation and Planning (KETEP) (No. 20171510300590)

Reference

1. C. John Bland, 'Choosing Fitting Functions to Describe Peak Tails in Alpha-particle Spectrometry', Applied Radiation and Isotopes, vol 49, pp 1225-1229 (1998)
2. S.Pomme, B. Caro Marroyo, 'Improved Peak Shape Fitting in Alpha Spectra', Applied Radiation and Isotopes, vol 96, pp 148-153 (2015)

