[붙임 1]

2019년 학술발표대회 발표신청서

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발표논문			
육종 · 식품 · 바이오 ( )	의생명 · 의료 ( )	첨단소재 · 환경복원 ( )	기기 · RI (○)

제 목	Quantification and uncertainty analysis of low-resolution gamma-ray spectrometry using Bayesian inference	
발표방법	구 두 ( ) 포스터 (○) **(선택해주세요)**	[구두발표 : 20분간 (발표15분, 질의/응답 5분)] [포스터발표 : 90cm(가로) × 120cm(높이)를 기준]

본인은 (사)한국방사선산업학회 정기학술발표대회에서 위와 같이 발표를 하고자 신청합니다.

2019 년 10 월 4 일

신청인 : 김 진환 (인)

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[붙임 2] 초록제출 양식

Quantification and uncertainty analysis of low-resolution gamma-ray spectrometry using Bayesian inference

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Analyses of gamma spectra to identify and quantify radioactive materials are increasingly important for many practical radiation detection applications. However, two problems commonly emerge during these quantitative analyses: (1) existing methods that are based on frequentist inference ignore the concept of uncertainty invariably associated with statistical fluctuations in physical processes, and (2) the performance of such an analysis is poor, especially when evaluating complex low-resolution spectra composed of a greater variety of isotopes. In this study, we propose a Bayesian approach in which the estimate of uncertainty in the activity ratio of isotopes is described in terms of the probability distribution for isotope identification and a quantitative analysis. To evaluate the proposed method, we acquired several complex spectra with mixture configurations of up to eight isotopes based on a two-inch thallium-doped sodium iodide (NaI(Tl)) detector via a simulation and experimentally. From the results, we show that incorporating the uncertainty in the activity ratio by means of Bayesian inference can provide both accurate and reliable estimates and that the level of these results can be preserved even for the highly fluctuating spectra. Furthermore, we demonstrate that the uncertainty estimates allow us to identify isotopes that do not contribute to the gamma spectrum when the isotopes are not included in the isotope library, thus leading to a reduction in the number of false alarms.

Keywords : Bayesian inference, quantitative analysis of radioisotope, low resolution spectra, uncertainty estimate