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FEASIBILITY STUDY OF DECAY ENERGY SPECTROSCOPY OF ALPHA EMITTING RADIONUCLIDES

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ABSTRACT

We report a cryogenic detection technique to measure the energy and the activity of alpha decays absorbed inside metallic 4π geometry. A small amount of ^{241}Am used as an alpha emitter is completely enclosed by Au foils. The energy of Alpha particles is meant to be converted into the thermal energy of the Au sandwiches as well as that of the recoiled nuclides, low energy electrons, and low energy x-rays and gamma rays. The temperature pulses from each event of an alpha decay are measured with a Au:Er metallic magnetic calorimeter attached to the Au absorber. The measured spectrum shows two clear peaks which can be fit to two Gaussian curves with 1/500 FWHM. The relative signal size and the rate between the peaks suggest that the less dominant peak is due to 59.5 keV gamma escapes from the 4π Au absorber. It can be inferred that the events showed in the more dominant peak are resulted from the total decay energy (Q) transferred to the absorber despite different decay branches. Additional peak with very low activity, 0.2% of the ^{241}Am rate is appeared at 1.05 times larger energy than the major peak of ^{241}Am. It is likely due to possible ^{244}Cm impurities. In the present report, we also discuss the possible use of this method for identifying alpha emitting radionuclides with precise decay rates.

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