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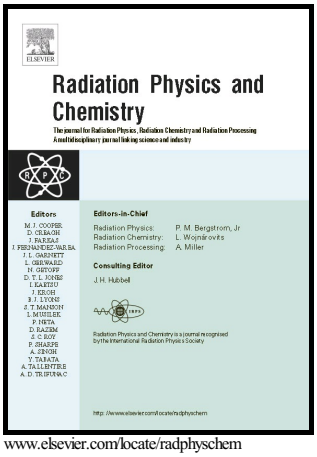

www.elsevier.com/locate/radphyschem

PII: S0969-806X(17)30069-5
DOI: http://dx.doi.org/10.1016/j.radphyschem.2017.01.011
Reference: RPC7367

To appear in: *Radiation Physics and Chemistry*

Received date: 30 September 2016
Revised date: 10 January 2017
Accepted date: 17 January 2017

Cite this article as: Mayeen Uddin Khandaker, Samer K.I. Ali, Hasan Abu Kassim and Norhasliza Yusof, Evaluated cross-sections of ^{55}Co radionuclide, a non-standard positron emitter for clinical applications, *Radiation Physics and Chemistry,* http://dx.doi.org/10.1016/j.radphyschem.2017.01.011

Evaluated cross-sections of ^{55}Co radionuclide, a non-standard positron emitter for clinical applications

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Abstract

Production cross-sections of Cobalt-55 ($T_{1/2}$=17.53 h, $E_{\beta^+}^{mean} = 570$ keV, $I_{\beta^+}^{total} = 76\%$), a non-standard positron emitter have been evaluated in the energy range of 40 MeV down to the threshold energy of the ^{56}Fe(p,2n)^{55}Co nuclear reaction due to its significance as a potential PET imaging agent in medical applications. Experimental cross-sections of ^{55}Co radionuclide that lies within the scope of this work were collected from the EXFOR database, and renormalized using the latest agreed values of decay data and monitor cross-sections. Simultaneous Evaluation on KALMAN (SOK) code combined with least-squares method was applied to the corrected cross-sections to obtain evaluated cross-sections together with the covariance information. Knowledge of the underlying uncertainties in evaluated nuclear data, i.e., covariances are useful to improve the accuracy of nuclear data.

Keywords: Cobalt-55 radioisotope; β^+-emitter; data evaluation; covariance; medical applications.

1. Introduction

Nuclear data, especially cross-sections and decay data play an important role in the choice of a radionuclide for various applications. Decay profile such as decay energy, radiation type and half-life of a particular radionuclide determines the suitability of that radionuclide for possible applications in nuclear medicine. On the other hand, data of nuclear reaction cross-sections determine the possibility of producing a radionuclide in pure form or in no carrier added (NCA) form. Updated information of nuclear decay data can be obtained without significant deviation from established data bases such as the ENSDF library (Nichols and Tuli, 2007) and National Nuclear Data Center NUDAT-2 data base (Junde, 2008). But production cross-sections for a particular