Contribution ID: **132** Type: **not specified**

Evaluation of the NEEC resonance window widths for 93mMo isomer in the case of electron capture into atomic shells for the assumed electronic excited configurations

Wednesday, 5 September 2018 13:45 (15 minutes)

The main objective of this study is to determine the optimal conditions for a detailed knowledge of the nuclear excitation by electron capture (NEEC) process for selected nuclear isomers (i.e. metastable exited states of atomic nuclei) of a few elements. The part of these research focuses on the especially interesting and important case of NEEC process for the 93mMo isomer (T1/2 ~ 6.8 h), for which the NEEC process has been very recently registered for the first time [1, 2], on the world's most powerful Digital Gammasphere Spectrometer, installed in the linear accelerator (ATLAS) at Argonne National Laboratory in the USA [2].
The evaluation of the NEEC resonance window widths for 93mMo isomer will mean in practice determining the width of the atomic level for the state obtained after the electron capture to the unfilled shells, using the multiconfiguration Dirac-Fock (MCDF) method [3-8], because the contribution from the nuclear level width is only about 1.3 x 10-7 eV. Accordingly to this, it is worth to underline that the resonance should occur if the resonance window is sufficiently wide (i.e. in practice if enough large is the natural width of the atomic state obtained after the electron capture to particular subshells) in the comparison with amount of change of studied ion (of particular element) kinetic energy in single collision.
Obtained in this study knowledge allow to understand the processes occurring in the Universe, and in particular to provide a fundamental information concerning the survival of the nuclei of different isotopes of the elements in stellar environments. The results of this study will be a starting point for applied research, which aim will be to allow the controlled release of energy stored in the nuclear isomer of selected elements. Moreover, these studies will also contribute to the development of the concept of new, unconventional and ultraefficient nuclear batteries.

Selected session

Nuclear Structure, Spectroscopy, and Dynamics

Primary author: Prof. SŁABKOWSKA, Katarzyna (Faculty of Chemistry, Nicolaus Copernicus University in Toruń)

Presenter: Prof. SŁABKOWSKA, Katarzyna (Faculty of Chemistry, Nicolaus Copernicus University in Toruń)

Session Classification: Nuclear Structure and Dynamics (SALONE BOLOGNINI)