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Ordinary muon capture as a probe of $\beta\beta$ **decays**

A reliable description of the double-beta-decay processes needs a possibility to test the involved virtual transitions against experimental data. Unfortunately, only the virtual transitions trough lowest J^{π} states can be probed by the traditional electron capture or β^{-} -decay experiments. The ordinary muon capture (OMC) offers a versatile tool to analyze the nuclear structu

experiments. The ordinary muon capture (OMC) offers a versatile tool to analyze the nuclear structure of the intermediate states involved in double-beta-decay processes. In the present work the OMC rates for muon captures

on the nuclei 24 Mg, 32 S and 56 Fe populating the low-lying states of the nuclei 24 Na, 32 P and 56 Mn are calculated.

The nuclear states for isobaric doublets ²⁴Mg, ²⁴Na, ³²S, ³²P and ⁵⁶Fe, ⁵⁶Mn are computed

by the nuclear shell-model code NuShellX@MSU. The A = 24 and 32 states are computed in the sd-shell and A = 56 states in

the pf-shell using different interactions without any configuration restrictions. The nuclear matrix elements and partial

capture rates to the lowest J^{π} states of the daughter nuclei are computed using the one-body transition densities

(OBTDs) given by the shell-model code.

It has been found that the two lowest 1^+ intermediate states play a significant role in the OMC processes. Also, the

lowest 2^+ state has a strong impact on the transition rates. The OMC process can be used to probe the structure of the

intermediate states appearing in the double-beta-decay process since the associated momentum exchange is of the

order of 100 MeV, i.e. the same amount which is carried by the virtual Majorana neutrino in the neutrinoless double beta decay. Experimental measurements in the near future can help

fine-tune the nuclear-structure parameters for the double-beta-decay calculations, but also give access to the effective values of the axial-vector coupling g_A and the induced pseudoscalar coupling g_P .

Primary author: Ms JOKINIEMI, Lotta (University of Jyväskylä)

Co-authors: Prof. FREKERS, Dieter (Westfälische Wilhelms-Universität, Münster, Germany); Prof. EJIRI, Hiroyasu (Research Center for Nuclear Physics, Osaka University); Prof. SUHONEN, Jouni (University of Jyväskylä)

Presenter: Ms JOKINIEMI, Lotta (University of Jyväskylä)