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Nuclear responses for double beta decay and muon capture

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To describe the double beta decay processes reliably one needs a possibility to test the involved virtual transitions against experimental data. In this work we manifest how to utilise
the nuclear and lepton (μ) charge-excange reaction data in the study of $0\nu\beta\beta$ decay and astro-neutrinos. In my contribution I will cover the theoretical aspects of ordinary muon capture (OMC) as well as the recent studies of (3He,t) and charge-echange studies at RCNP, Osaka [1].

The OMC strength function in 100Nb was computed in the pnQRPA framework [2], and compared with the experimental strength function measured at RCNP in Osaka [3]. The calculated first OMC giant resonance in 100Nb is in agreement with the experimental value. However, the computed total OMC strength is higher than the measured strength, which refers to quenched g_A value.
Furthermore, the OMC rates to the daughter nuclei of the $0\nu\beta\beta$ decay triplets of immediate experimental interest are computed [4] and compared with available data of [5].
The capture rates to the low-lying states of 76As are in accordance with the data. The OMC rates to the daughter nuclei of $0\nu\beta\beta$ decay triplets are also compared with the corresponding $0\nu\beta\beta$ matrix elements in order to find possible connections between them [6].

Eventually, the OMC process can be used to probe the structure of the intermediate states appearing in the double-beta-decay process. Future experiments can help fine-tune the nuclear-structure parameters for the double-beta-decay calculations.

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