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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-exchange 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 $(3\text{He},t)$ and charge-exchange studies at RCNP, Osaka [1].

The OMC strength function in ^{100}Nb 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 ^{100}Nb 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 ^{76}As 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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