THE EFFECT OF UNPAIRED NUCLEONS ON THE β-DECAY PROPERTIES OF THE NEUTRON-RICH NUCLEI

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Predictions of β-decay properties is needed for analysis of the radioactive ion-beam experiments and for modeling of astrophysical r-process. Their special importance is in ensuring more reliable extrapolation of β-decay data to extreme N/Z ratios. The correct description of the Q_β-values, neutron separation energies S_{xn} in the daughter nucleus provides a reliable prediction of the half-life and the probability of emission of delayed neutrons. To calculate the binding energy of the odd-odd and even-odd nuclei we consider the effect of the unpaired neutron and proton on the superfluid properties of nuclei, the well-known blocking effect [1]. As an example, we study the β-decay properties of neutron-rich nuclei $^{72\text{-}80}$Ni. The properties of the ground state of the parent and daughter nuclei are calculated in the HF-BCS method with the Skyrme forces, taking into account the tensor terms [2]. It is shown that taking into account the blocking effect improves the description of the Q_β-values. Using the quasiparticle random phase approximation [3, 4] we describe the β-decay half-lives. The emission of delayed neutrons in the β-decay of $^{78, 80}$Ni isotopes is predicted.

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