

SELF-CONSISTENT CALCULATIONS OF THE GROUND STATE AND β -DECAY PROPERTIES IN C, N, O REGION.

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Including the light neutron-rich nuclei to the r-process network is known to change the resulting heavy element abundances [1]. However, large-scale predictions of input data, in particular the β -decay rates are usually obtained in the HF+BCS Quasiparticle Random Phase (QRPA) approximations. In case of the light neutron-rich nuclei they have to be taken with some care. In loosely bound isotopes close to the particle continuum in which a weak pairing approximation does not work, the cluster effects dominate [2].

The applicability limit of self-consistent description of the beta-decay properties using iterative HF+BCS for the ground state and continuum pnQRPA [3] is carefully checked for very neutron-rich C, N, O nuclei around the neutron shells at N=8,16 and compared with relativistic RHB+RQRPA [4] and FRDM+RPA [5] frameworks. Supported by the grant of Russian Scientific Foundation (RSF 21-12-00061).

Fig. 1. The S_{xn} -values within the DF3a functional and FRDM in 22-30O isotopes.

Fig. 2. The $T_{1/2}$ and total Pn-values calculated from DF3a+CQRPA and RHB+RQRPA in O isotopic chain compared with AME-2020.

1. Terasawa, M., K. Sumiyoshi, T. Kajino, G. J. Mathews, and I. Tanihata, *Astrophys. J.* 562, 479 (2001).
2. J. Okolowicz, M. Ploszajczak, W. Nazarewicz, *Prog.Theor. Phys.Sup.*,196, 230,2012
3. I. N. Borzov ,*Phys.Rev. C*67, 025802 (2003); *Phys.At. Nuclei* 83, 700(2020)
4. T. Marketin, L. Huther, and G. Mart´ nez-Pinedo, *Phys. Rev. C* 93, 025805 (2016).
5. P. Moller, M. R. Mumpower, T. Kawano, and W. D. Myers, *At. Data Nucl. Data Tables* 125, 1(2019).

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