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Evolution of neutron shell structure of N = 14, 16 isotones

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The evolution of neutron single-particle characteristics of isotones with N = 14, 16 was studied in the dispersive optical model /1/ in Z region from 7 to 20. The calculation was performed with the parameters both extrapolated in accordance with the global parameters KD (KDUQ) /2, 3/ and with the diffuseness parameter a_{HF} depending on the neutron excess. With an increase in the neutron excess, the energy gap N = 14 and N = 16 is reduced and widens respectively. In addition, the deviation $\Delta_F = |\langle E_{1d_{5/2}}, E_{2s_{1/2}}\rangle - E_F|$ of the middle between the $1d_{5/2}$ and $2s_{1/2}$ energies from the Fermi energy E_F increases for N = 14 isotones. It reflects the disappearance of N = 14 magicity when approaching the neutron drip line. While, the deviation $\Delta_F = |\langle E_{2s_{1/2}}, E_{1d_{3/2}}\rangle - E_F|$ for isotones with N = 16 decreases. An increase in the a_{HF} parameter for unstable isotones enhances this effect. The obtained results are consistent with the double magicity of ^{24}O (N = 16) and ^{34}Ca (N = 14) nuclei. As an example, Fig.1 shows the evolution of neutron single-particle energies E_{nlj} near the Fermi energy of isotones with N = 14. The deviation Δ_F is represented relative to the value of particle-hole energy gap G.

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Section

Nuclear structure: theory and experiment

Primary author: BESPALOVA, Olga (Scobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State Unoversity)

Co-authors: KLIMOCHKINA, Anna (Physics Department of Lomonosov Moscow State Universiry; Scobeltsyn Institute of Nuclear Physics of Lomonosov Moscow State Unoversity); MOSUNOV, Maxim (Physics Department of Lomonosov Moscow State Universiry; Scobeltsyn Institute of Nuclear Physics of Lomonosov Moscow State Unoversity)

Presenter: BESPALOVA, Olga (Scobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State Unoversity)

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