

Quasimagic nuclei and pseudospin symmetry

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The impetus for development of the shell model of nuclei was given by the experimental data indicating on specific properties of nuclei having magic numbers of protons and/or neutrons. The shell model is based on the idea of the self-consistent nuclear mean field and the spectra of the single-particle levels with characteristic gaps. Such gaps in the spectra of single-particle states for a number of reasons may occur not only at the classical magic numbers of nucleons. The well-known example is ^{146}Gd with the number of protons $Z=64$. The properties of this nucleus were intensively discussed in the 80s–90s. It turned out later, that the reason for the distinguished role of the proton number $Z=64$ is pseudospin symmetry in the spectra of single-particle states. The same symmetry is manifested in the properties of nuclei from the regions $Z=30\text{--}38$, $N=50$ and $Z=84\text{--}100$, $N=126$.

From the very beginning of the use of the shell model, a huge role was revealed that the neutron-proton interaction plays in the structure of nuclei. When studying the properties of nuclei far from the stability region, new magic numbers were discovered, the reason for their appearance is the n-p interaction.

This report is devoted to the discussion of these issues.