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NUCLEUS SURFACE TENSION AND ITS MICROSCOPIC RESONANCE DESCRIPTION

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Deviations of nuclear properties from shell model predictions are very sensitive to value of nuclear surface tension [1]. Although the quantitative estimation of these deviations is not yet possible, a level of deviation is indicated by the values of the nuclear surface tension coefficient σ. These deviations are minimal for nuclei with high values of the coefficient σ. The nuclei of iron isotopes with even numbers of neutrons are characterized by relatively small values of σ (see Fig. 1). The maximum value of σ for the 54Fe nucleus is 9 times less than the surface tension of the 48Ca nucleus [1]. The calculation of resonant excited states of nuclei with small values of σ within the framework of the traditional many-particle shell model (MPSM) [2] does not lead to an adequate description of the energy distribution of the excitation probabilities. Agreement with experiment can be achieved using the method "particle-core coupling shell model" (PCCSM) [3], where experimental values of spectroscopic factors are taken into account. For the 54Fe nucleus, this method has led to a satisfactory theoretical description of the GDR [4]. The role of "magic numbers" in the formation of the value of σ is shown in Fig. 1: the surface tension of the 54Fe nucleus is more than 2 times higher than its values for other stable iron isotopes. The influence of proton "magic numbers" is clearly seen from the comparison of Ni and Fe surface tension coefficients (Fig. 1).

Fig. 1. Values of surface tension coefficients for Fe and Ni isotopes.

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No

Section

1. Nuclear structure: theory and experiment

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