1164

NATURE OF ALFA-CLASTER STATES OF ATOMIC NUCLEI FOR 1D, 2S, 1F SHELLS

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Nucleonic associations in atomic nuclei can be of the very various kinds: alpha-particle, deuteron, fruition etc. We would like to discuss this problem on the example of alpha-association. An algebraic description of cluster motion includes a vectorial boson, i.e. the cluster states are generated by means of the scalar ($J^{\pi} = 0^{+}$) and the vectorial ($J^{\pi} = 1^{-}$) -bosons.

In a real situation one of fragments can be distorted, and the clasterization can turn out to be not hard, but soft, corresponding to oscillation of one of clusters relatively the other. These problems are taken into account by a construction of the boson model of U (6) 0 U(4) - symmetry [1].

We have calculated alpha-cluster states: ^{28}Si, ^{32}S, ^{44}Ti and have compared our results with experimental data on (^{6}Li, d) - reactions. The parameters of the theory are given as following:

	E_a(Mev)	εp(Mev)	α(Mev)	β(Mev)
^{28}Si	13	0.19	0	0.13
^{32}S	5	0.06	0	0.22
^{44}Ti	11	0.10	0	0.15

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DYNAMICAL SYMMETRICAL AND SUPERSYMMETRICAL PROPERTIES OF NUCLEAR STATES

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If the system is possessed of dynamical symmetries then its hamiltonian can be expressed by polynomial which composed from elements X of Lee-algebra:

$$H = E_0 + \sum_i \varepsilon_i \sum_{i<j} V_{ij} X_i X_j + \ldots$$

The total problem with such hamiltonian can be decided, if own function and own meaning of algebra's elements X are found. The interacting boson model (IBM) is an example of the dynamical symmetry problem. It has achieved a significant success in the phenomenological description of collective motion in medium and heavy nuclei at low excitation energies. The interacting boson model for description of nuclear states structure in which collective configurations strongly mixed with a quasiparticle ones has been generalised in this work. In this work we also studied [1] in more detail whether the structure of the whole energy spectrum including yrast, β and γ bands and the observed backbanding phenomena of the deformed nuclei can be described in terms of the whole basic states of the IBM-1 plus two-quasiparticale pairs.

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SUPERSYMMETRICAL PROPERTIES OF NUCLEAR STATES AND STUCTURE OF EVEN-EVEN DY NUCLEI

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In this work we have investigated the structure of energy spectra and hackbending phenomena of the isotope string of Dy with mass number between 154 and 164.We extend the SU(3)-limits of Interacting boson model to allow a boson to break to form a quasiparticle pair, which can occupy $h_{11/2}$ u $i_{13/2}$ orbitals. The calculated energy levels, intensity of the electromagnetic transitions, including the ground state, β, and γ band are in satisfactory agreement with observed values for the whole string of Dy isotopes. Backbending of the moment of inertia of the yrast and β states can be reproduced reasonably.

Recently, very high spin states up to I~40 and a double backbending have been observed in some nuclei in rare-earth region [1]. These phenomena might hopefully be interpreted by considering two or more bosons to break to form more quasiporticle pairs and make more bands crossings to form the double backbending. Our calculation suggests a very easily to handle the recently observed very-high-spin states in some rare-earth nuclei.

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