SHAPE AND PAIRING PHASE TRANSITIONS IN ATOMIC NUCLEI

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There are three well known limiting models describing collective motion in even-even nuclei: vibrator, axially symmetric rotor, and gamma-soft or axially asymmetric rotor. The physical pictures presented by these models are used as a basis for description of the observed properties of nuclei belonging to different parts of the nuclide chart. It is known also that with variation of the number of nucleons the nuclear shape and pairing correlation strength are changed. Sometimes a smooth evolution of these characteristics are observed. However, there are examples of the abrupt changing of the shape and pairing. In the last years examples of the shape phase transitions with the excitation energy increase have been found.

In this review a microscopical mechanism of the origin of the shape phase transitions using interaction between nucleons with the key role played by the monopole proton-neutron interaction will be discussed. Some examples of the so called shape coexistence and creation of deformation with angular momentum increase will be described. The heaviest superheavy nuclei discovered in Dubna's hot fusion experiments are predicted to have small quadrupole deformation of the order of a typical value of the amplitude of the zero point oscillations of the shape of spherical nuclei. At the same time they can be prolate or oblate, or even triaxial as it follows from the calculations.

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