Clusterization and phase-transitions in atomic nuclei*

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Atomic nuclei show evidence for different kind of phase transitions. Some of them are very similar to those of the classical thermodynamics, apart from the finite size effects, e.g. the liquid-gas transition in nucleonic matter. Others have different nature, e.g. they take place at zero temperature, yet they show many similarities to the well-known phase transitions. The latter ones are called shape-phase transitions or quantum phase transitions. Much work has been devoted to the study of this phenomenon in relation with the quadrupole collectivity of atomic nuclei [1].

Recently we have started to investigate the phases and phase transitions of the clusterized nuclei in a similar manner [2]. In the present contribution we plan to present some results concerning the large N limit (where N is the number of particles) of the algebraic cluster models. These include the vibron model [3], the semimicroscopical [4], and the phenomenological [5] algebraic cluster models (these latter two have the same group structure, and interactions, but their model space are different from the viewpoint of the exclusion principle). Various interactions are applied [6]. Furthermore, numerical studies are presented, concerning the survival of the quasi-dynamical U(3) symmetry [5], as well as for obtaining realistic spectra in comparison with experimental data [7].

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