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Size isomers at threshold states

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The size of a nucleus defined by the radius of its nucleon (proton and neutron) density distribution and the proton charge distribution is one of the most fundamental and important nuclear characteristics. Nuclear radius determines the basic properties of nuclei and is a consequence of the fundamental features of the strong interaction. The development of methods of measuring the radii of nuclei in their short-lived excited states led to discovery of new classes of states, which were named "the size isomers". Up to now two groups of the size isomers were identified: the excited states with halos (^{9}Be, ^{11}Be, ^{13}C, ^{13}N) and some specific alpha cluster states (^{11}B, ^{12}C, ^{13}C). All the observed states are diluted, however, some indication to possible existence of more compact than the ground states was obtained as well (in ^{13}C). The phenomenon of size isomerism occurred to be not a rare one especially if one takes into account that rotational bands are based on some of such states. The structure of size isomers is related with some new features, e.g., rotating halos, halos in continuum, different types of quasimolecular configurations. Some rudimentary signs of alpha particle condensation (a "ghost"of condensate) were observed (in the Hoyle state of ^{12}C), however, one cannot speak about confirmation of this ambitious theory. Analogs to the Hoyle state are expected in ^{11}B, ^{13}C, ^{16}O, ^{20}Ne near the α-emission thresholds are considered.

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