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Structure of resonance states in three-alpha systems

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In many phenomena of atomic nuclei, the α-particle (the ^{4}He nucleus) can be considered as effective degrees of freedom. In this contribution, recent works on structures of low-energy excited (resonance) states in ^{12}C nucleus in terms of 3α model will be presented.
Continuum 3α wave functions for angular momentum and parity states: 0^+, 1^-, 2^+, and 3^-, are obtained with phenomenological 2α- and 3α potentials by using Faddeev technique. These resonance states turn to be effective in explaining such reactions of $^{12}\mathrm{C}(\alpha,\alpha')3\alpha$. The wave functions in resonance states have some concentrations in amplitude near the origin, from which one can evaluate 3α configurations. These structures are, in general, mixtures of equilateral triangle and isosceles triangle (or bent-arm configuration) with various sizes. From the comparison of these structures, possible excitation mechanisms of 3α states, such as breathing-mode excitation and rotational excitation, are studied.

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