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Algebraic treatment of α-cluster nuclei

Content

In this talk I review the algebraic cluster model (ACM) for α -cluster nuclei [1] with A = 4k and its extension to the cluster shell model (CSM) for A = 4k + x nuclei [2]. The ACM and CSM provide a new theoretical approach for the study of alpha-clustering in light nuclei based on the discrete symmetry of the underlying geometric configuration of α particles. The ACM was introduced in a study of 12C in terms of a cluster of three α -particles in a triangular configuration with D3h symmetry [2]. The corresponding ground state rotational band is characterized by the sequence 0⁺, 2⁺, 3⁻, 4[±] and 5⁻, including the prediction of a parity doublet, 4+ and 4-, and the existence of a 5⁻ state [3]. An interesting question is to what extent the α -cluster structure survives under the addition of extra nucleons. The CSM describes the behavior of single-particles levels in a deformed field generated by the cluster of α -particles [4]. As an example, I discuss the properties of the neighboring nucleus ¹³C [5,6].

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