独立行政法人理化学研究所　仁科加速器研究センター
第148回 RIBF核物理セミナー
RIKEN Nishina Center for Accelerator Based Science
The 148th RIBF Nuclear Physics Seminar

Cluster structure and isoscalar monopole excitation in light nuclei

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Isoscalar monopole excitation to cluster states in light nuclei is in general strong as to be comparable with the single particle strength and shares an appreciable portion of the sum rule value. We discuss the isoscalar monopole strength function S(E) in 16O up to E_x <40 MeV. We found that the fine structures at the low energy region up to E_x ¥simeq 16 MeV in the experimental S(E) obtained by the 16O(alpha,alpha') reaction can be rather satisfactorily reproduced within the framework of the 4alpha cluster model, while the gross three bump structures observed at the higher energy region (16 < E_x < 40 MeV) look likely to be approximately reconciled by the mean-field calculations such as RPA and QRPA. In this talk, it is emphasize that 1) two different types of monopole excitations exist in 16O; one is the monopole excitation to cluster states which is dominant in the lower energy part (E_x < 16 MeV), and the other is the monopole excitation of the mean-field type such as one-particle one-hole (1p1h) which is attributed mainly to the higher energy part (16 < E_x < 40 MeV), and 2) this character of the monopole excitations originates from the fact that the ground state of 16O with the dominant doubly closed shell structure has a duality of the mean-field-type as well as alpha-clustering character. We also stress that the isoscalar monopole excitation is useful to search for cluster states in light nuclei.

July. 24(Tue), 2012　13:30～
RIBF Hall, RIKEN

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