

Frontiers in Gamma Ray Spectroscopy

FIG18

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Excited states up to band termination and beyond in a near-spherical f7/2-shell nucleus

Content :

Nuclei with Z and N between 20 and 28 are unique as the $A \sim 40$ nucleons occupying $f_{7/2}$ shell outside ^{40}Ca core are low enough to allow a full shell model description, but at the same time the numbers are large enough to develop collective behavior. The level scheme of ^{51}Cr nucleus with four proton particles and one neutron hole is indicative of single particle nature. But a strongly deformed band was also suggested in this nucleus [1]. Therefore it is an ideal candidate for observing the interplay between single-particle and collective structures, and for comparing the shell model and collective model within the same nucleus. High-spin states in ^{51}Cr were populated using the $^{27}\text{Al}(^{28}\text{Si}, 3\text{pn})$ reaction and studied using INGA array at TIFR. This allowed the extension of the level scheme beyond band termination. The suggested deformed band has also been observed for the first time in a heavy-ion reaction. A $\Delta J=1$ sequence of transitions with energies that follow the $J(J+1)$ rule has been observed. Large scale shell model calculations in the full fp model space, with and without sub-shell restrictions, were performed. Lifetime, DCO ratio and polarisation measurements has been carried out. Results in detail will be presented during the meeting.

Reference:

[1] J. Kasagi and H. Ohnuma, J. Phys. Soc. Japan 45, 1009 (1978).

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