DISCRETE LINKING TRANSITIONS FOR SUPERDEFORMED BANDS IN THE MASS-80 REGION*

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After the superdeformed (SD) bands in ^{152}Dy were linked to normal-deformed (ND) states [1], the $A \approx 80$ region became the only SD region remaining in which no discrete linking transitions had been observed. Recently, we have succeeded in a search for one-step linking transitions in ^{84}Zr, viewed as the "doubly-magic" SD nucleus in this region [2].

Several nuclides with known SD bands were populated in the 140-MeV ^{32}S + ^{58}Ni reaction in an experiment using the Gammasphere γ-ray spectrometer and Microball charged-particle detector array. In this experiment, the nucleus ^{84}Zr was strongly populated in the $\alpha 2p$ evaporation channel. Some of our results for ^{84}Zr include:

- Identification of several discrete, single-step transitions between the yrast SD band and states in the ND well, which, combined, carry about 2% of the SD-band intensity, suggesting these decays are of a statistical nature.
- I^{π} assignments for this band through an angular-correlation measurement of the links.
- Lifetimes of states in the SD band, which yield $B(E1) \sim 5 \times 10^{-6}$ W.u. for the link to the ground-state band.
- Identification of an excited SD band (not linked to the yrast SD band or to ND states).

The characterization of the yrast SD band and decay to the ND well permits a direct comparison with several theoretical models:

- The excitation energy, spin, $\Im^{(2)}$, and Q_t values of the SD band are reasonably well reproduced by the Cranked Strutinsky–Lipkin-Nogami calculations in Ref. [2].
- The absence of observed links between excited and yrast SD bands in any of the $A \approx 80$ nuclei, in contrast to observations in $A \approx 150$ and 190 SD nuclei, suggests an absence of octupole excitations in this region as predicted in Ref. [3].
- Calculations using the generator coordinate method, which should provide a prediction for the transition rates between the SD and ND wells, are in progress.

Despite searches in several of the nuclei neighboring ^{84}Zr, none other has yet to reveal discrete linking transitions that could be placed unambiguously into a level scheme. In ^{87}Nb ($3p$ channel), for example, a candidate linking transition appears to feed several different ND states, suggesting there is an unobserved intermediate state. This observation is consistent, however, with these links being of a statistical nature.

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