

POSSIBLE EVIDENCE OF $T = 0$ n - p PAIRING IN SUPERDEFORMED
 $N \approx Z$ ZINC ISOTOPES*

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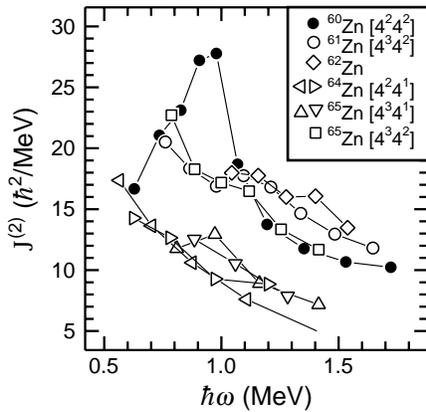


Figure 1: $J^{(2)}$ moment of inertia for SD and HD bands in $^{60-65}\text{Zn}$. Symbol $[4^n 4^p]$ denotes that the band has n $g_{9/2}$ neutrons and p $g_{9/2}$ protons occupied.

With our recent studies of superdeformed (SD) bands in mass $A=60$ region, it is now possible to make a systematic analysis of these SD nuclei. Such an analysis is unique, since $A=60$ is so far the only region where superdeformation is observed in self-conjugate nuclei and their neighbors. In this paper we report a surprising phenomenon which has emerged from the analysis of zinc isotopes. Among the seven SD bands established [1-5] in $^{60-65}\text{Zn}$, the SD band in ^{60}Zn [1] shows a pronounced alignment (Fig. 1). Such an alignment was initially interpreted [1] as the simultaneous excitation of a pair of $g_{9/2}$ protons and a pair of $g_{9/2}$ neutrons, since the valence protons and neutrons of ^{60}Zn occupy the same orbital. However, it is difficult to understand the complete blocking of this alignment in all other bands (Fig. 1). For example, in ^{61}Zn , one expects the alignment to be reduced, but not completely blocked, since the odd neutron should only block the neutron part of the alignment. Such a partial blocking has indeed been observed in mass $A=70-80$ region, where simultaneous proton and neutron $g_{9/2}$ band crossings were well studied. The complete blocking of the alignment shown in Fig. 1 suggests that additional correlations may be responsible for the observed alignment in ^{60}Zn .

Our recent data on ^{65}Zn established a band that has an alignment similar to the one observed in ^{60}Zn . A more careful analysis shows that this ^{65}Zn band most likely has a $[4^2 4^2]$ (see figure caption) configuration, which is identical to that assigned to the SD band in ^{60}Zn . As a result, the only two bands that show the alignment have 2 protons and 2 neutrons occupying the same $[440] 1/2$ intruder $g_{9/2}$ orbits. Remarkably, none of the other bands possesses such an identical proton- and neutron-occupation of the $g_{9/2}$ intruder orbits. This implies that whenever the occupation of the intruder $g_{9/2}$ orbital(s) is not identical for neutrons and protons, the correlation that is responsible for the alignment is quenched. Such a phenomenon suggests that this new correlation could be the $T = 0$ n - p pairing, which so far has not been well understood.

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