

p- and sd-shell Λ -hypernuclei with shell model approach

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Hypernuclear structure studies have been progressing steadily through the K^- - and π^- -induced production reaction experiments, especially by the recent γ -ray coincidence measurements with the large volume Ge detector. Moreover a series of recent $(e, e'K^+)$ reaction experiments from the Jefferson Laboratory provide high-resolution data of the low-lying energy levels for p -shell hypernuclei. These data are quite helpful in better understanding of hyperon-nucleon interactions, though the data are still limited to about ten hypernuclear species.

As the next stage of hypernuclear studies, new projects of high-intensity and high-resolution $(K^-, \pi^- \gamma)$ and $(\pi^+, K^+ \gamma)$ reaction experiments are being scheduled at the J-PARC facility. New experiments are also planned at the Jefferson Laboratory.

In order to meet these experimental projects, updated theoretical studies are needed for prediction and/or comparison with the coming quality data. So far we have made detailed theoretical analyses of hypernuclear level structures, γ -transition rates, and the production cross sections by employing the extended shell models for ${}^9_{\Lambda}\text{Be}$, ${}^{10,11}_{\Lambda}\text{Be}$, ${}^{11,12}_{\Lambda}\text{B}$, ${}^{19}_{\Lambda}\text{F}$, etc.

In this talk we focus our attention on the interplay between the hyperon motion and the nuclear core states. First, we discuss that the extended shell-model calculation is successful in explaining the new peak observed in the ${}^{10}\text{B}(e, e'K^+){}^9_{\Lambda}\text{Be}$ experiment. It is attributed to the lowering of p_{Λ} (perpendicular) state due to the strong coupling with α - α like nuclear core deformation as already known in the case of ${}^9_{\Lambda}\text{Be}$. Second, we will show the results of new calculations for an sd -shell hypernuclear structure of ${}^{27}_{\Lambda}\text{Mg}$, in which the even-even core nucleus ${}^{26}\text{Mg}$ is shown to have rotational bands. Thus we see coupling of the p_{Λ} orbital and the core deformation. For the ${}^{27}\text{Al}(\gamma, K^+){}^{27}_{\Lambda}\text{Mg}$ reaction, we also discuss the DWIA cross-section spectra that are calculated with the microscopic shell-model wave functions.

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