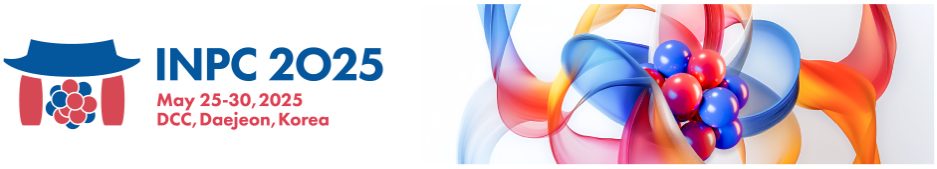

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Searching deuteron clusters in mid-heavy nuclei via ^{40,42,44,48}Ca(p,pd) knockout reaction

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Deuteron knockout reactions on calcium isotopes, ^{40,42,44,48}Ca(p,pd) serve as a valuable probe for understanding nuclear clustering phenomena, particularly deuteron-like correlations within nuclei. These reactions provide a unique opportunity to study the interplay between cluster and shell components in nuclear structure. Recent experimental results have demonstrated the formation of α clusters in dilute neutron-rich tin isotopes, observed via (p,pα) knockout reactions [1]. Additionally, the generalized relativistic density functional theory predicts that the clustering of deuterons, tritons, ^{3}He, and α particles evolves simultaneously on the dilute surface of nuclei [2]. Furthermore, if the clustering mechanisms of deuterons and α particles resemble each other, the neutron-excess dependence of deuteron formation probability is expected to behave similarly [3].

Based on the theoretical and experimental insights mentioned above, a deuteron knockout experiment on calcium isotopes, ^{40,42,44,48}Ca(p,pd), was carried out by the ONOKORO project group using a 230 MeV proton beam at RCNP, Osaka, Japan. Deuterons from the knockout reaction, acting as clusters, were unambiguously detected at the focal plane of the Large Acceptance Spectrometer for each calcium isotope. Incident protons, following the knockout of clusters, were also detected at the focal plane of the Grand Raiden spectrometer to correctly reconstruct the envisaged events. Results from the analysis of experimental data will be presented in this study.

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