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Development of large GAGG:Ce calorimeter for measurements of the cluster knockout reactions

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We have launched the “ONOKORO” project to understand cluster formation phenomena in nuclei and nuclear matter from measurements of the cluster knockout reactions ((p,pX) reactions ($X=d, t, {}^3\text{He}, \alpha$)).

In order to measure the reactions using inverse-kinematics, we have developed the “TOGAXSI” telescope consisting of Si trackers and large GAGG:Ce calorimeters. The required performance of the calorimeter is high energy resolution (~ 1.4 MeV (rms)) under the high count rate (~ 100 kcps) and wide energy range (100 A-250 A MeV). Therefore, we have developed new calorimeter using large GAGG:Ce crystal ($35\text{ mm} \times 35\text{ mm} \times 120\text{ mm}$) which is high resolution (8-9 % (662 keV, FWHM)), high density ($\sim 6.63\text{ g/cm}^3$) and fast response (decay time ~ 90 ns).

In this presentation, we report recent results of the performance test with proton and α beam at HIMAC, QST.

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