

## Search for $\alpha$ clustering in $^{14}\text{O}$

$\alpha$  clustering is a well-known phenomenon in light nuclei where two neutrons and two protons strongly correlate to constitute an  $\alpha$  particle as a building block of atomic nuclei. A linear alignment of the  $\alpha$  clusters, referred to as linear-chain cluster state (LCCS), has been of great interest since 1950s but until now there is no clear experimental evidence demonstrating the existence of such a state. Recently, it was theoretically pointed out that excess nucleons in non-4N nuclei occupy molecular orbitals between  $\alpha$  clusters and the excess nucleons may stabilize LCCS. A candidate of LCCS in  $^{14}\text{C}$  was experimentally proposed by H. Yamaguchi et al. [1].

It is an interesting issue whether the similar LCCS also exists in the mirror nucleus  $^{14}\text{O}$  or not. The excess neutrons are replaced by protons in this case, and thus the energy shifts between  $^{14}\text{C}$  and  $^{14}\text{O}$  due to the Coulomb force should reflect spatial distribution of the excess nucleons. Therefore, it is expected to reveal the structure of the LCCS candidate by measuring its energy in  $^{14}\text{O}$  and comparing it with that in  $^{14}\text{C}$  and theoretical calculation.

Since  $^{14}\text{O}$  is an unstable nucleus, it must be generated as a secondary particle. We conducted the experiment to search for  $\alpha$  cluster states in  $^{14}\text{O}$  at CRIB facility of CNS, the Univ. of Tokyo in June 2019. In this experiment, we injected a  $^{10}\text{C}$  secondary beam at 36 MeV into the He gas target at 650 Torr, and measured the resonant elastic scattering of  $\alpha+^{10}\text{C}$  with the Si detectors at 0 and  $\pm 9$  degrees by the thick target method. We will report details of the experiment and results in the talk.

### References

- [1] H. Yamaguchi et. al. Experimental investigation of a linear-chain structure in the nucleus  $^{14}\text{C}$  *Phys.Lett.B*, 766:11, 2017

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