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Neutron Dripline Search for Fluorine, Neon and Sodium and Discovery of 39Na at RIKEN RIBF

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A search for new isotopes near the neutron dripline was conducted for fluorine, neon and sodium at RIKEN RIBF [1], in which isotopes were produced by projectile fragmentation of an intense 48Ca beam at 345 MeV/nucleon, and separated and identified in flight using the large-acceptance two-stage separator BigRIPS [2,3]. The 48Ca beam intensity was as high as ~540 pnA. In the experiment we determined the neutron dripline at fluorine and neon to be 31F and 34Ne, respectively [4] and discovered an extremely neutron-rich isotope 39Na with neutron number N = 28 [5].
These results provided us with a key to understanding the nuclear structure at extremely neutron-rich conditions. The location of neutron dripline and the nuclear binding near the existence limit are determined reflecting details of underlying nuclear structure, such as the evolution of the nuclear shell property and the associated nuclear deformation. The nuclear deformation, caused by the magicity loss at N = 20 and 28, plays a key role in the nuclear binding in this region and thus in determining the particle stability of 39Na as well as the location of the neutron dripline at fluorine and neon. In this talk I will outline the discussions of such intriguing nuclear structure as well as overview the experiment.
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Email Address

kubo@ribf.riken.jp

Presenter if not the submitter of this abstract

Primary author: KUBO, Toshiyuki (RIKEN Nishina Center)

Presenter: KUBO, Toshiyuki (RIKEN Nishina Center)

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