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Nuclear structures near and beyond the neutron drip line studied by breakup reactions at SAMURAI at RIBF

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Some of the first results from kinematically complete measurements of breakup reactions on neutron-rich boron to oxygen isotopes, along and beyond the neutron drip line, are presented and discussed. These experiments were performed at the recently-commissioned large-acceptance multi-purpose spectrometer SAMURAI (**S**uperconducting **A**nalyser for **MU**lti-particles from **Ra**dio-**I**sotope Beam) at the new-generation RI beam facility, RIBF, at RIKEN. The experiments aimed at probing the two-neutron Borromean halo nuclei, ^{19}B and ^{22}C, and at exploring the heavy oxygen isotopes, ^{25,26}O, which are beyond the neutron drip line. The study of ^{19}B and ^{22}C has been made primarily by the Coulomb breakup, which is sensitive to the halo states and associated two-neutron correlations [1,2]. ^{22}C has drawn much attention due to the possibility that it has the largest halo known [3]. In addition, ^{22}C may also exhibit features consistent with the new magic number N=16, as was recently suggested by our inclusive measurement of the momentum distribution of ^{20}C following breakup on a C target [4]. ^{25}O and ^{26}O have drawn much attention since these unbound nuclei may have keys to understand why the neutron drip line ends anomalously closer to the stability for oxygen isotopes. ^{25}O and ^{26}O have been produced by the proton removal reactions on ^{26}F,^{27}Ne, and ^{27}F,^{28}Ne, respectively, at 220-250 MeV/nucleon. Preliminary data are shown and discussed. Finally, some perspectives on future projects using the SAMURAI facility are presented.

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