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Physics of Exotic Nuclei at RIBF

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"Exotic nuclei" far from the stability line are unique objects of many-body quantum system, where ratios of neutron number to proton number are much larger or much smaller than those of nuclei found in nature. Their exotic properties and phenomena emerge from their large isospin asymmetry, and even affect scenarios of nucleosynthesis in the universe. Efforts have been made to produce and investigate such exotic nuclei at the accelerator facilities in the world. One of the facilities, the Radioactive Isotope Beam Factory (RIBF) facility at RIKEN, Japan has delivered intense radioactive isotope (RI) beams since 2007. In US, the Facility for Rare Isotope Beams is being constructed to start around 2020. To access nuclei far from the stability line, especially neutron- rich nuclei, the RIBF facility is highly optimized for inflight production of fission fragments via a U beam. The Super-conducting Ring Cyclotron delivers a 345 MeV/u U beam. The U nuclide is converted at a target to fission fragments. An inflight separator BigRIPS was designed to collect about 50% of fission fragments produced at the target and separate nuclei of interest. The RI beams produced at BigRIPS are then delivered to several experimental devices. Large-scale international collaborations have been formed at three spectrometers to conduct unique programs for the investigation of decay properties single particle orbits, collective motions, nucleon correlation, and the equation-of-state of asymmetric nuclear matter. Nuclear binding energy will be measured at a newly constructed ring for the r-process path, and charge distribution of exotic nuclei will be examined at a unique setup of an RI target section in an electron storage ring. Ultra slow RI beams available at a gas catcher system will be utilized for table-top and high precision measurements. In this talk, I would give a facility overview of RIBF, and introduce objectives at RIBF. Special emphasis would be given to selected recent highlights. Several coming programs would be shown and discussed, too.