Exotic decay modes of medium-mass proton drip-line nuclei*

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High energy available in beta decay of nuclei lying far to the left from the stability path leads to population of highly excited states in the daughter nuclei. This, combined with decreasing charged-particle separation energies in the daughter nuclei, opens windows for a variety of decay modes with beta-delayed (multi-) particle emission. The study of these decay channels provide a unique tool for gaining an insight and understanding on the nuclear structure in this region, given their competitiveness against the de-excitation via gamma radiation. Moreover, decay data of these nuclei can provide an important input for the astrophysical rp-process modeling and thus understanding the abundance of elements in the universe.

During the previous decade, several experiments studying decays of exotic medium-mass neutron-deficient isotopes were performed using Warsaw Optical Time Projection Chamber. I will present the results of two of them. In the first experiment, conducted at the National Superconducting Cyclotron Laboratory at Michigan State University several Ge and Zn isotopes were produced and investigated. Among the outcomes are the first identification of ^{59}Ge, the first information on beta decay properties of ^{60}Ge and the measurement of the cross-section for the most neutron-deficient germanium isotopes. The two most neutron-deficient silicon isotopes known to date, ^{22,23}Si, were investigated in the second experiment, performed using the MARS spectrometer at the Cyclotron Institute of Texas A&M University. The data collected allowed confirmation of all known decay channels for both isotopes, as well as for the extension of the known energy spectra for the delayed protons to lower energies and the identification of new decay branches in ^{23}Si.

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