Contribution ID : **4** Type : **not specified**

Studies of Two Proton radioactivity

Monday, 21 February 2011 11:00 (40)

Extremely proton-rich nuclei with odd or even atomic numbers were predicted by V. Goldansky in 1960 to decay through one- or two-proton radioactivity, respectively. Two-proton (2p) radioactivity, a spontaneous decay of an atomic nucleus by emission of two protons, is the most recently discovered nuclear disintegration mode. It has first been reported for 45Fe in 2002 with a half-life of about 4 ms, which is 1000 times longer than the quasi-classical estimate of “di-proton” (or 2He) cluster emission. Further observations of 2p radioactivity in 19Mg, 54Zn, 48Ni, 94mAg have confirmed unexpectedly large half-lives of 2p precursors thus indicating regular existence of long-lived nuclei beyond the proton drip line. The experimental methods used to produce, identify and detect new nuclear species via their 2p decay will be reviewed. The up-to-date theoretical understanding of specific observables accessible in the 2p decay measurements will be discussed with an emphasis on 2p-precursor’s nuclear structure.

Summary

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Session Classification : Monday February 21st, 2011. 11:00 - 13:00