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# Beta decay Studies of several Tz=-1 and Tz=-2 nuclei in the fp shell

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We have studied the Tz = -1 -> 0 beta decays of 42Ti, 46Cr, 50Fe and 54Ni to the self-conjugate nuclei 42Sc, 46V, 50Mn, and 54Co respectively (Ph.D Thesis, Francisco Molina- Uni. Valencia) at GSI during the stopped beam RISING campaign. The nuclei of interest were produced in the fragmentation of a 58Ni beam at 680 MeV/nucleon. The number of implanted ions of the nucleus of interest was typically 3-6 x 106 in total. The excellent statistics allowed us to determine, among other things, the absolute B(F) and B(GT) values for the Fermi and Gamow-Teller beta transitions. The B(GT) values are of importance inter alia in terms of a comparison with the analogous Charge Exchange (CE) reactions on the mirror nuclei (Fujita et al.,PRL95(2005)212501). The differences between the B(GT) values obtained from the beta decay, which were not large but clearly visible, and the CE can be attributed either to isospin symmetry breaking or to complexities associated with the CE reaction mechanism. A better understanding of this second possibility has an important impact on our understanding of GT excitations in nuclei and the long standing problem of the missing strength.
Motivated by these ideas we have pursued this further in experiments at GANIL, where we have studied the beta decays of the Tz=-1 58Zn and Tz=-2 56Zn nuclei above the f7/2 shell. However these nuclei are more difficult to produce due to the lack of appropriate Tz=+1 stable targets.
The high intensity beam at RIKEN together with the EURICA array would allow us to extend these studies to higher masses and more exotic cases. This would allow, for instance, the study of mirror symmetry in heavier mass systems by comparison with the corresponding charge exchange reactions.
Amongst the cases of interest are the very neutron-deficient Tz=-2 Se and Ge nuclei, which could be compared with the mirror CE process, and the Tz=-1 Ge, Se, and Kr nuclei which are of interest from several viewpoints, a) to study the evolution of the B(GT) strength in the fp shell, b) to study further the "Quasi-rule" for the M1 transitions (Warburton and Weneser in "Isospin in Nuclear Physics", 1969, SBN 7204 0155 0)and c) to study a possible proton-neutron condensate. 71Kr decay is also of great interest since its g.s. seems to be different from its mirror 71Br.
All these cases could be studied using the fragmentation of a 78Kr beam at RIKEN and the EURICA array and could be coupled to the experiment proposed by B. Blank and collaborators, which focuses on two-proton radioactivity, and is already approved.

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