HAW14-2014-020105

Abstract for an Invited Paper
for the HAW14 Meeting of
the American Physical Society

Beta-delayed neutron emission measurements for r-process nuclei

IRIS DILLMANN, TRIUMF

Beta-delayed neutron- (bn-) emitters play an important, two-fold role in the stellar nucleosynthesis of heavy elements in the "rapid neutron-capture process" (r process). On one hand they lead to a detour of the material beta-decaying back to stability. On the other hand, the released neutrons increase the neutron-to-seed ratio, and are re-captured during the freeze-out phase and thus influence the final solar r-abundance curve. A large fraction of the isotopes for r-process nucleosynthesis are not yet experimentally accessible and are located in the "terra incognita." With the next generation of fragmentation and ISOL facilities presently being built or already in operation, one of the main motivation of all projects is the investigation of very neutron-rich isotopes at and beyond the border of presently known nuclei. However, reaching more neutron-rich isotopes means also that multiple neutron-emission becomes the dominant decay mechanism. The investigation of bn-emitters has recently experienced a renaissance. I will show some recent results from a GSI campaign with the BELEN detector, and introduce the program planned for 2015/16 at RIKEN with the "BRIKEN" detector [1]. "BRIKEN" ("Beta-delayed neutron measurements at RIKEN for nuclear structure, astrophysics, and applications") is a worldwide effort which combines 3He-neutron counters from groups in Germany, Japan, Russia, Spain, and the USA and the implantation detector AIDA from the UK to the presently largest and most efficient neutron detection setup. Planned first experiments comprise the first-time measurements of 48 b-delayed one-neutron and 24 b-delayed two-neutron emitters in the regions around doubly-magic 78Ni and 132Sn. Even some b-delayed three-neutron emitters in the heavier mass region will be tackled for the first time.

[1] "The BRIKEN Neutron Detector," Detector Construction Proposal, approved by the RIKEN NP-PAC (2013).