Improving nuclear data input for r-process calculations around A∼80

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The distribution of solar system elemental abundances, after correction for s-process contributions, shows a maximum around A∼80 sometimes called the 1^{st} r-process abundance peak. However the origin of the elements contributing to this peak is uncertain and several astrophysical processes have been proposed. Observations in ancient ultra metal poor stars [1] indicate that other mechanisms contribute here and may be even dominant [2]. We consider here a weak r-process [3], which can occur in core-collapse supernova events [4] or neutron star mergers [5]. Sensitivity studies [6] indicate the need to measure half-lives $T_{1/2}$ and neutron emission probabilities P_n for neutron-rich nuclei in this region, as the prediction of different theoretical calculations disagree significantly, and these quantities shape the final abundance distributions.
The BRIKEN project was launched to expand our knowledge on $T_{1/2}$ and P_n values to not-yet-accessed very neutron-rich nuclei over the entire nuclear chart, that are important for r-process abundance calculations. It exploits the very large beam intensities of the RIBF facility at RIKEN [7] and the selection capability of the BigRIPS in-flight separator [8] adding new advanced state-of-the-art instrumentation. We will report about the experiment performed in June 2017 aiming at the A∼80 region, where the BRIKEN neutron counter [10] was combined with the AIDA implant and decay detector [9]. Some preliminary results for $T_{1/2}$ and P_n values will be presented and compared with theoretical calculations. Their impact on calculated abundances will be explored.

References

[1] C. Sneden *et al.*, Ann. Rev. Astron. Astroph. 46, 24 (2008).

[2] C.J. Hansen *et al.*, Astroph. J. 797, 123 (2014).

[3] R. Surman *et al.*, AIP Advances 4, 041008 (2014).

[4] S. Wanajo, Astroph. J. Lett. 770, L22 (213).

[5] A. Perego *et al.*, Month. Not. Roy. Astron. Soc. 443, 3134 (2014)

[6] T. Shafer *et al.*, Phys. Rev. C 893, 055802 (2016).

[7] H. Okuno*et al.*, Prog. Theor. Exp. Phys. 2012, 03C002 (2012).

[8] T. Kubo *et al.*, Prog. Theor. Exp. Phys. 2012, 03C003 (2012).

[9] T. Davinson *et al.*, http://www2.ph.ed.ac.uk/ td/AIDA/

[10] A. Tarifeo-Saldivia *et al.*, J. Instrum. 12, 04006 (2017).