Contribution ID: **103** Type: **Oral**

Galactic Production of 138La: Impact of 138,139La statistical properties

The odd-odd neutron-deficient 138La is very long-lived but one of the less abundant nuclei in the solar system. It is expected to be one of 35 p-nuclei. Most p-nuclei with A>110 are thought to be produced by photo-disintegration of s- and r-process seed nuclei. However, this photo-disintegration cannot satisfactorily explain the observed abundance of 138La and more exotic processes such as the electron neutrino capture on 138Ba have been called for to explain its synthesis [1, 2]. The neutrino reaction can to some extent explain the observed abundance of 138La but the significance of the photo-disintegration process cannot be ruled out due to the limited knowledge and uncertainties of nuclear properties entering the 138La production, such as nuclear level densities (NLD) and Photon Strength Function (PSF) [2]. These are critical model input parameters for the astrophysical reaction rate calculations. Measurements are necessary to place the nuclear properties on a solid footing in order to make statements regarding the importance of neutrino reactions. In this presentation I will discuss our recently measured NLD and PSF of 138,139,140La and their impact on the galactic production of 138La. This work has also been been published on Phys. Lett. B. 744 (2015) 268 and Phys. Rev. C. 95 (2017) 045805.

References

[1] S.E. Woosley et al., Ap. J. 356 (1990) 272
[2] S. Goriely et al., A 375 (2001) 35

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