Contribution ID: **36** Type: **Oral**

Stellar s-process neutron capture cross sections on ^{A}Se and ^{A}Ce

Monday 5 September 2022 15:15 (15 minutes)

Neutron-induced reactions remain at the forefront of experimental investigations for the understanding of stellar nucleosynthesis and chemical evolution of the Galaxy in the region of medium- and heavy-mass nuclides [1]. We report on measurements of the cross section of neutron capture reactions ^{74,80,82}Se(n,γ) and ^{138,140,142}Ce(n,γ) relevant, respectively, to the weak and main s-processes. The ^{A}Se data complement our recent study of the ^{69,71}Ga stellar (n,γ) reactions in the weak s-process regime [2]. The proton rich isotope ^{74}Se is a p nuclide, shielded from the s and r processes by stable nuclei in the region. The disentanglement of the different heavy-nuclide synthesis modes (s-, r- and p-processes) requires reliable and precise stellar neutron-capture cross sections. Such is the case also for the Ce isotopes [3]. In particular, ^{140}Ce is found to be one of the most important nuclides in the network of s-process reactions, affecting the abundances of a large number of isotopes [4]. The experiments were performed by the activation technique using a high-intensity (3-5$\times10^{10}$ n/s) quasi-Maxwellian neutron beam that mimics conditions of stellar s-process nucleosynthesis. The neutron field was produced by a mA proton beam at E$_p$=1925 keV (beam power of 2–3 kW) as part of our experiment campaign at the Phase I of Soreq Applied Research Accelerator Facility (SARAF) [5], bombarding the Liquid-Lithium Target (LiLiT) [6,7]. The cross sections were measured by counting the resulted nuclei activities via γ spectrometry with a high-purity germanium detector.

This work was supported by the Pazy Foundation (Israel). M.P. acknowledges support by the European Union (ChETEC-INFRA, project no. 101008324).

[1] F. Kaeppeler et al., Rev. Mod. Phys. 83, 157 (2011).
[2] M. Tessler et al., Phys. Rev. C 105, 035801 (2022)
[3] F. Kaeppeler, et al., Phys. Rev. C 53, 1397 (1996)
[4] A. Koloczek, et al., At. Data Nucl. Data Tables 108, 1 (2016)
[5] I. Mardor, et al., Eur. Phys. J. A 54, 91 (2018)
[6] S. Halfon, et al., Rev. Sci. Instrum. 85, 056105 (2014)
[7] M. Paul, et al., Eur. Phys. J. A 55, 44 (2019)

Author: Dr SAHOO, R. N. (The Hebrew University of Jerusalem, Jerusalem, Israel 91904)

Co-authors: Dr TESSLER, Moshe (Soreq Nuclear Research Center, Yavne, Israel 81800); Dr HALFON, S. (Soreq Nuclear Research Center, Yavne, Israel 81800); Dr KASHIV, Y. (University of Notre Dame, Notre Dame, IN 46556, USA); Mr KIJEL, D. (Soreq Nuclear Research Center, Yavne, Israel 81800); Dr KREISEL, A. (Soreq Nuclear Research Center, Yavne, Israel 81800); Prof. PAUL, M. (The Hebrew University of Jerusalem, Jerusalem, Israel 91904); Dr SHOR, A. (Soreq Nuclear Research Center, Yavne, Israel 81800); Dr WEISSMAN, L. (Soreq Nuclear Research Center, Yavne, Israel 81800)

Presenter: Dr TESSLER, Moshe (Soreq Nuclear Research Center, Yavne, Israel 81800)

Session Classification: Monday - Session 3