

Stellar $^{36,38}\text{Ar}(n,\gamma)^{37,39}\text{Ar}$ Reactions Studied at SARAF-LiLiT

Tuesday, 26 June 2018 19:00 (1h 30m)

As part of a program of neutron-capture measurements in the regime of the weak s-process, we studied for the first time the $^{36,38}\text{Ar}(n,\gamma)$ reactions in the stellar neutron energy regime and their contribution to production of light neutron-rich nuclides.

The experiments were performed with the Liquid-Lithium Target (LiLiT) and the mA-proton beam at 1.92 MeV (2-3 kW) from the Soreq Applied Research Accelerator Facility (SARAF). The facility yields high-intensity quasi-Maxwellian (kT sim 30-50 keV) neutrons (3-5 times 10^{10} n/s). Gas samples were irradiated at the SARAF-LiLiT neutron source and the $^{37}\text{Ar}/^{36}\text{Ar}$ and $^{39}\text{Ar}/^{38}\text{Ar}$ ratios in the activated gas samples were determined by accelerator mass spectrometry at the ATLAS facility (Argonne National Laboratory).

The ^{37}Ar activity was also measured by low-level counting at the University of Bern. The measured values of the Maxwellian Averaged Cross Sections (MACS) are significantly lower than theoretical and evaluated values published so far. Nucleosynthesis He-burning calculations using the $^{36,38}\text{Ar}(n,\gamma)$ experimental MACS show that the residual mass fraction of ^{36}Ar increases by a factor of 10 while the mass fraction of neutron-rich nuclides in the region $A=36-48$ during the weak s-process is lowered by 10 to 50 %.

Summary

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