CALCIUM-41 PRODUCTION IN THE SOLAR SYSTEM.

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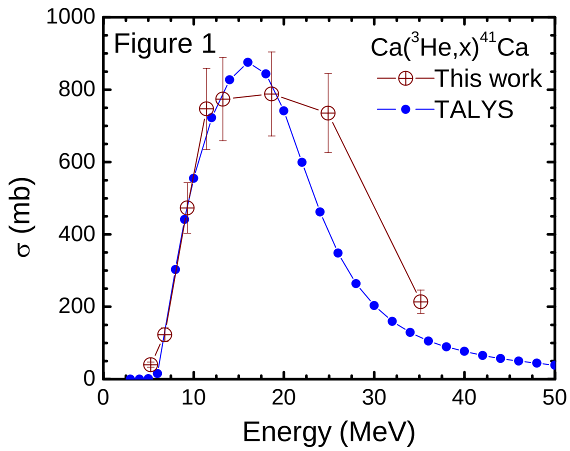
The X-wind hypothesis proposes that $^{1}H^{+}$ and $^{3}He^{2+}$ from the early Sun produced now-extinct ^{26}Al and ^{41}Ca. Initial model calculations with $^{1}H^{+}$ did not reproduce the isotopic footprints found in meteorites left by the decay of ^{26}Al and ^{41}Ca. Adding ^{3}He to the mix of nuclear-active particles improved the match for ^{26}Mg (from ^{26}Al) but overproduced ^{41}K (from ^{41}Ca). Uncertainties in $^{3}He^{2+}$ fluxes aside, X-wind models have suffered from a lack of ^{3}He cross section (σ) measurements. Recent measurements of cross sections for ^{26}Al[1,2] and ^{36}Cl [2] production from Mg, Al, and Ca have reduced these uncertainties. Here we report cross sections for the reaction $^{nat}Ca(^{3}He,X)^{41}Ca$ measured using accelerator mass spectrometry and compare them with values calculated using the code TALYS (Figure 1). These cross sections not only provide a basis for evaluating the X-wind hypothesis but also serve to validate the TALYS cross sections. With the newly measured cross sections, updated X-wind calculations of [3] give $^{26}Al/^{41}Ca$ production rate ratios of 165, a factor of about 30 larger than inferred from meteoritic observations. Without a long delay between production of ^{26}Al and ^{41}Ca and their incorporation in meteoritic material, a simple X-wind irradiation of chondritic matter does not reproduce experimental observations.



References:

[1] Fitoussi et al., (2004) *LPSC* **35**, 1586.pdf.
[2] Caffee et al., (2008) *LPSC* **39**, 1258.pdf.
[3] Leya et al., (2003) *Ap.J.* **594**, 605-616.