

MEASUREMENT OF CROSS SECTIONS FOR THE  $^{63}\text{Cu}(\alpha, \gamma)^{67}\text{Ga}$ 

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As has been pointed out in a number of recent papers (Ref. 1 and references therein), there are a number of astrophysical environments where charged-particle induced reactions on nuclei heavier than iron may play important roles. There are theoretical estimates of the cross sections for these kinds of reaction. However, until recently there has been little experimental data with which the theoretical estimates can be compared. We have measured cross sections for the  $^{63}\text{Cu}(\alpha, \gamma)^{67}\text{Ga}$  reaction for 5-8 MeV alpha particles using an activation technique. Stacks of four  $^{nat}\text{Cu}$  metal foils of 1 mg/cm<sup>2</sup> thickness and one  $^{nat}\text{Ti}$  foil of thickness 2.7 mg/cm<sup>2</sup> were bombarded with alpha beams from the 88-inch Cyclotron at LBNL. The titanium foil was used for checking the current integration by measuring and comparing with the known  $^{48}\text{Ti}(\alpha, n)^{51}\text{Cr}$  cross sections (2). Following each irradiation, the copper targets were counted immediately using an HPGe detector to observe  $^{68}\text{Ga}$ , produced through the  $^{65}\text{Cu}(\alpha, n)^{68}\text{Ga}$  reaction. The cross section for this reaction was measured and compared with data reported by Stelson et al. (3) as a check of the overall experimental technique. Later, all the copper foils were counted for longer periods of time to observe  $^{67}\text{Ga}$  using another HPGe detector located inside LBNL's Low Background Facility.  $^{63}\text{Cu}(\alpha, \gamma)^{67}\text{Ga}$  cross-sections were determined. The results of our measurements will be compared to modern Hauser Feshbach calculations.

**References**

1. R. D. Hoffman, S. E. Woosley, and Y.-Z. Qian, *Astrophys. J.* 482 (1997) 951.
2. A. J. Morton, S.G. Tims, A.F. Scott, V.Y. Hansper, C.I.W. Tingwell, and D.G. Sargood, *Nucl. Phys. A* 537 (1992) 167.
3. P.H. Stelson and F.K. McGowan, *Phys. Rev.*, 133 (1964) B911.