Li^6 and $Li^7(n,2n)$ Cross Sections*

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Absolute measurements of the 10.2- and 14.1-MeV (n,2n) cross sections of Li⁶ and Li⁷ have been made using the large scintillator technique. The cross sections in barns obtained for Li⁶ are: 0.033 ± 0.015 at 10.2 MeV and 0.070 ± 0.006 at 14.1 MeV. The Li⁷ cross sections are: 0.027 ± 0.015 at 10.2 MeV and 0.056 ± 0.005 at 14.1 MeV.

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THE energy dependence of the Li⁶ and Li⁷(n,2n)cross sections was measured using large liquidscintillator techniques previously described.^{1,2}

Separated metallic Li⁶ and Li⁷ were obtained from Oak Ridge in the form of disks $\frac{1}{4}$ in. thick and 5 in. in diam. A typical target assembly consisted of eight disks, each contained in a thin-walled aluminum can, spaced $\frac{1}{2}$ in. apart. The total amount of lithium used was 292.9 g of Li⁶ and 337.6 g of Li⁷. The Li⁶ material was



F1G. 1. Energy variation of measured (n,2n) cross sections for Li⁶ and Li⁷.

* Work done under the auspices of the U. S. Atomic Energy Commission.

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¹ V. J. Ashby, H. C. Catron, L. L. Newkirk, and C. J. Taylor, Phys. Rev. 111, 616 (1958).

² H. C. Catron, M. D. Goldberg, R. W. Hill, J. M. Le Blanc, J. P. Stoering, C. J. Taylor, and M. A. Williamson, Phys. Rev. **123**, 218 (1961). 99.67% lithium, of which 95.42% was Li^6 . The Li^7 material was 99.63% lithium, of which 97.65% was Li^7 .

The 14.1-MeV cross sections were obtained using neutrons from the Livermore Cockcroft-Walton. In addition to the corrections for time resolution, accidental doubles, background, and self-absorption described in reference 1, a correction was made for the relative amounts of Li^6 and Li^7 in the two targets.

The 10.2-MeV cross sections were obtained using neutrons from the Livermore cyclotron. Corrections were made for time resolution, accidental doubles, and self-absorption. The combination of the large backgrounds encountered while using the cyclotron and the

TABLE I. Measured (n,2n) cross sections of Li⁶ and Li⁷.

	$\sigma_{(n,2n)}$ (barns)		$E_{ m th}$
	10.2 MeV	14.1 MeV	(MeV)ª
Li ⁶ Li ⁷	0.033 ± 0.015 0.027 ± 0.015	0.070 ± 0.006 0.056 ± 0.005	6.2 8.2

^a E_{th} is the threshold energy for the reaction given by B. T. Feld, in *Experimental Nuclear Physics* edited by E. Segrè, (John Wiley & Sons, Inc., New York, 1953), Vol. II, p. 350.

small observed counting rates produced a large fluctuation in the cross sections obtained from different runs. Since this fluctuation was of the order of $\pm 30\%$, it was not considered worth while to do an accurate calculation of the self-absorption correction at 10.2 MeV. Corrections of approximately 7% previously calculated by Monte Carlo methods for the energy of 14.1 MeV were used.

The measured cross sections are given in Table I. A graph of the data given in Fig. 1 shows that the cross sections are consistent with a linear variation with energy between threshold and 14 MeV, in a manner similar to that found for deuterium.²