III DATA EVALUATION

Pb(n,2n) CROSS SECTION AT 14.1 MeV

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As well known, Pb is a potential candidate of the neutron multiplier of the fusion reactor, so its (n,2n) cross section at 14 MeV is of importance. Since the discrepancies exist between the measurements, difficulties exist in the evaluations to meet the accuracy of 3% [1] needed for the blanket design. This work is carried out to get a new evaluation of Pb(n,2n) cross section at 14.1 MeV for checking the angle–integrated neutron emission cross section and to see whether it is possible to meet the needed accuracy of 3 %.

It is well known that the two direct measurements of (n,2n) cross section for many nuclides by large liquid scintillation tank [2,3] deviate from the most measurements systematically, i.e., the Frehaut's measurements (1980) lower,[4] and the Ashby's measurements (1958) higher systematically than other well done measurements by, for example, activation method. The amount of the differences can be estimated through comparison of these measurements to some well measured or evaluated values. As shown in Table 1 and Table 2, it is clear that the Frehaut's measurements are 10 % lower and Ashby's measurements 25 % higher than the well evaluated values.

After +10 % and −25 % corrections to the measurements for Pb element by Frehaut et al. and by Ashby et al. respectively, and all other available data [5~10] corrected to 14.1 MeV, all results including those measured by neutron emission spectrum and other method are in good agreement with each other, as shown in Table 3. The Flerov's measurement depends on non–elastic scattering cross section of Pb at 14.1 MeV. The value they used is in agreement with the newly evaluated ones.

The uncertainties of all measurements are essentially given by the authors. The Vonach's result is quoted from Ref. [8], no more information is available.

The weighted average and equal weight averaged results of the eight measurements and the $\chi^2/(n-1)$ value are also shown in Table 3. The equal

weight averaged value 2252 ± 40 is adopted in the present evaluation.

Table 1 Comparison of Frehaut's measurements with well evaluated values

Element	Frehaut, 14.7 MeV	Evaluated Value, 14.7 MeV	F / E
Co	730	800 (ENDF / B–V)	0.91
Cu	610	673.9 (Ryves[11])	0.90
Au	1940	2127 (Ryves[11])	0.91

Table 2 Comparison of Ashby's measurements with well evaluated values

Element	Ashby, 14.1 MeV	Evaluated Value, 14.1 MeV	A / E
Cu	760	609 (Ryves[11])	1.25
Au	2600	2073 (Ryves[11])	1.25

Table 3 Pb(n,2n) cross sections

Author	E_n (MeV)	$\sigma_{n,2n}$ (b)	corr. to 14.1 MeV	Meth. of meas.
Tak.(88) [5]	14.1	2.43 ± 0.12	2.43 ± 0.12	n–emission
Iwa.(88) [6]	14.1	2.21 ± 0.17	2.21 ± 0.17	n–emission
Yan.(84) [7]	14.1	2.33 ± 0.12	2.33 ± 0.12	n–emission
Vonach [8]	14.1	2.103 ± 0.065	2.103 ± 0.065	n–emission
Fre.(76) [2]	14.1	1.976 ± 0.15	2.17 ± 0.12	scint.tank
Mas.(72) [9]	14.2	2.24 ± 0.15	2.23 ± 0.15	
Fle.(58) [10]	14.1	2.30 ± 0.19	2.30 ± 0.19	graph.prism
Ash.(58) [3]	14.1	2.74 ± 0.20	2.19 ± 0.15	scint.tank

Weighted average 2.208 ± 0.040

$\chi^2 / (n-1)$ 1.07

Equal weight average 2.252 ± 0.036

REFERENCES

[1] E. T. Cheng. 88 MITO, : 187

[2] J. Frehaut et al., BNL-NCS-51245, : 399 (1980)

[3] V. Ashby et al., Phys. Rev., 111, (1958) 616

[4] A. Pavilik and H. Vonach, Phys. Data, 13-4, 1988

[5] A. Takahashi et al., JAERI-M-88-065, : 279 (1988)

[6] S. Iwasaki et al., 88MITO, : 229

[7] Y. Yanagi, A. Takahashi, OKTAVIAN Rep. A-84-02, Osaka Univ., (1984)

[8] M. Mizumoto, "Brief description of evaluation of lead isotopes for JENDL-3". For the IAEA meeting, Vienna, May, (1989)

[9] V. Maslov, YK-9,50 (1972)

[10] H. Flerov et al., AE 5(6),657 (1958)

[11] T. Ryves, "A Simultaneous Evaluation of Some Important Cross Sections at 14.7 MeV", private communication, (1987)

PROGRESS ON NEUTRON DATA EVALUATION ACTIVITIES IN LANZHOU UNIVERSITY

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INTRODUCTION

Lanzhou University is one of the earliest units which joined the Chinese Nuclear Data Coordination Network (CNDCN). The research subjects are supported by the Chinese Nuclear Data Center (CNDC).

In Lanzhou University, the research work on neutron data evaluation started in 1978. Up to now, the evaluations of Ti, Sn, Sb, ^{181}Ta, ^{197}Au and re-evaluations of Sn, ^{181}Ta have been completed respectively, Besides, the systematic study for (n,2n),(n,3n), and (n,x) (x=p, t, ^{3}He, d, α) reaction cross sections have been performed since 1985.