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LABORATORY RECORDS
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REPORT NO. CP-333

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NAME Whitaker

SUMMARY -- NEUTRON CROSS-SECTIONS OF THE ELEMENTS

H. W. Ibser

INV.
52

November 5, 1942

The following are "probable" values based on the available evidence as tabulated in Report CP-334, which is an undigested compendium of the neutron cross-section data obtained as of September 1942, and lists cross-sections for both high and low energy neutrons. In arriving at the present values, the relative reliabilities of the various measurements, and the standards used, have been considered. Dr. E. Fermi has kindly discussed these values with the compiler, and has made several helpful suggestions regarding the values and the form of the table.

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Per Letter Instructions Of
TID-1116
M. Hickey
For: N. T. Bray, Supervisor
Laboratory Records Dept.
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CROSS SECTIONS OF THE ELEMENTS FOR SLOW NEUTRONS, IN 10^{-24} cm^2, AND COMBINATION COEFFICIENTS IN 10^{-20} $\frac{cm^3}{sec}$

a -- absorption cross-section

s -- scattering cross-section

α-- av

Each cross-section is given to one more figure than what is considered a reliable value. Cross-sections for thermal (T) neutrons are given were available; otherwise, cross-sections for "C" neutrons are given.

Notation:

--, no value available
<, upper limit given
~, authors regard value as order of magnitude
?, value depends on results of only one author-group

ATOMIC NO. & WEIGHT	ATOM	ENERGY	a	s	α	ATOMIC NO. & WEIGHT	ATOM	ENERGY	a	s	α
1-1.0078	H	T	.39	--	10.5			C		4.8	
		C		42		7-14.008	N	T	1.1	--	30
1-2	D	C	.0025	5.7	.088			C		10.1	
2-4.002	He	C		1.5		8-16.000	O	C	<.01	4.1	<.354
3-6.940	Li	C	72	--	2550	9-19.00	F	C	.009	4.1	
4-9.02	Be	T	.0122	--	.329	10-20.183	Ne	C	a+s=3?		
		C		4.8		11-22.997	Na	C	.45	3.5	15.9
5-10.82	B	T	770		20,800	12-24.32	Mg	C	.30	3.2	10.6
6-12.00	C	T	.0046		.124	13-26.97	Al	C	.20	1.3	7.07
		C		4.8							

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ATOMIC NO. & WEIGHT	ATOM	ENERGY	a	s	∝	ATOMIC NO. & WEIGHT	ATOM	ENERGY	a	s	∝
14-28.06	Si	T	.17?	--	4.6?	38-87.63	Sr	C	1.5?	9.4?	53?
		C		2.5		39-88.92	Y	C		<14?	
15-31.02	P	C	.25	10.3	8.8	40-91.22	Zr	C	a+s=16.7?		
16-32.06	S	C	.40	1.0	14.3	41-93.3	Cb	C	5?	~ 10?	180?
17-35.457	Cl	C	28	<10	990	42-96.0	Mo	C	2.4?	6.6?	85?
18-39.944	A	C	a+s=2.5?			43	Ma		--	--	
19-39.10	K	C	3.2?	4	113?	44-101.7	Ru	C	5.9?	7?	209?
20-40.08	Ca	C	.49?	10	17.3?	45-102.01	Rh	C	140	--	4950
21-45.10	Sc		--	--		46-106.7	Pd	C	3?	7?	110?
22-47.90	Ti	C	5.6	6.2	198	47-107.880	Ag	C	60	6.0	2100
23-50.95	V	C	6.2	3	219	48-112.41	Cd	C	2800	1.2?	
24-52.01	Cr	C	2.3	3.3	81	49-114.8	In	C	167?	--	5910?
25-54.93	Mn	T	12.0	2.8	324	50-118.70	Sn	C	.64?	4.3	22.6?
26-55.84	Fe	C	2.2?	10.0	78?	51-121.76	Sb	C	5.2	6.5?	184
27-58.94	Co	C	25	7	880	52-127.5	Te	C		5.3	
28-58.69	Ni	C	6.2	19.5	219			C	a+s=8.2?		
29-63.57	Cu	C	4.3	7	152	53-126.932	I	C	6.2	3	219
30-65.38	Zn	C	1.0	5.0	35.4	54-130.2	Xe		--	--	
31-69.72	Ga	C	1.5?	<4	53?	55-132.81	Cs		--	--	
32-72.60	Ge	C	a+s ~75			56-137.36	Ba	C	1.3?	8.2?	46?
33-74.93	As	C	5	7.1?	180	57-138.90	La	C	a+s=80?		
34-79.2	Se	C	11.2?	12.6?	396?	58-140.13	Ce	C	a+s ~25		
35-79.916	Br	C	7	5?	250	59-140.92	Pr	C	a+s=25?		
36-82.9	Kr	C	a+s=27?			60-144.27	Nd	C	a+s=220?		
37-85.44	Rb		--	--		61-146(?)	(Il)		--	--	

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ATOMIC NO. & WEIGHT	ATOM	ENERGY	a	s	∝
62-150.43	Sm	C	a+s=5000		
63-152.0	Eu	C	215?	--	7600?
64-157.3	Gd	C	a+s=25,000		
65-159.2	Tb	C	a+s< 1000		
66-162.6	Dy	T	2500?	--	68,000?
67-163.5	Ho	C	a+s ~400		
68-167.64	Er	C	a+s=120?		
69-169.4	Tm	C	a+s ~500		
70-173.5	Yb	C	a+s=90?		
71-175.0	Lu	C	a+s ~400		
72-178.6	Hf		--	--	
73-181.4	Ta	C	4.5?	10?	159?
74-184.0	W	C	~10?	~10?	354?
75-186.31	Re	C	a+s= 89?		
76-190.8	Os	C	a+s= 27?		
		C		10.8?	
77-193.1	Ir	C	300		10,600?
78-195.23	Pt	C	~14?	8.5?	~500?
79-197.2	Au	C	86	--	3,040
80-200.61	Hg	T	540?	--	14,600?
		C		28?	
81-204	Tl	C	a+s= 13		
82-207.22	Pb	T	.15	--	4.1
		C		8	
83.209.00	Bi	T	.016	--	.45
		C		9.0	

ATOMIC NO. & WEIGHT	ATOM	ENERGY	a	s	∝
84	Po		--	--	
85			--	--	
86-222	Rn		--	--	
87			--	--	
88-225.97	Ra		--	--	
89			--	--	
90-232.12	Th	C	25?	6.0?	880?
91	Pa		--	--	
92-238.14	U	T	3.2	12	183
		T	fission: 4.6		

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