

Streulängen und -querschnitte

Table 2.2 Summary of bound scattering lengths and cross sections, for low-energy neutron scattering. Only the most common isotopes of each element have been tabulated. The data are obtained from the compilation by Sears (1984). Reproduced by permission of Atomic Energy of Canada Limited). Column 1, chemical symbol of the element; column 2, atomic number; column 3, mass number; column 4, spin parity of the nuclear ground state; column 5, relative abundance (%). For radioisotopes, the half-life is given instead, columns 6, 7, bound coherent and incoherent scattering lengths, respectively. The imaginary part is indicated if existing; columns 8, 9, 10, coherent, incoherent and total scattering cross sections, respectively. As usual they are given in barns (1 barn = 10^{-24} cm²); column 11, absorption cross section (in barns).

Reference: SEARS, V.F. (1984) 'Thermal-neutron scattering lengths and cross-sections for condensed matter research' Chalk River Nuclear Laboratories, Chalk River, Ontario, Canada.

Z	A	Spin	Relative abundance	Coherent scattering length (10 ⁻¹⁵ m)	Incoherent scattering length (10 ⁻¹⁵ m)	Coher.	Incoh.	Scat.	Absorp.		
H	1			-3.7409		1.7586	79.90	81.66	0.3326		
	1	1/2	99.985	-3.7423	25.217	1.7599	79.91	81.67	0.3326		
	2	1	0.015	6.674	4.033	5.597	2.04	7.64	0.00051		
	3	1/2	(12.32A)	4.94	0.00	3.07	0.00	3.07	0		
He	2			3.26		1.34	0.00	1.34	0.00747		
	3	1/2	0.00014	5.74	-i × 1.48	-1.8	+i × 2.56	4.42	1.2	5.6	5333.
	4	0	99.9998	3.26	0	1.34	0	1.34	0		
Li	3			-1.90		0.454	0.91	1.36	70.5		
	6	1	7.5	2.0	-i × 0.26	-1.79	+i × 0.25	0.51	0.41	0.92	940.
	7	-3/2	92.5	-2.22		0.619	0.78	1.40	0.0454		
Be	4	9	-3/2	100	7.79	0.20	7.63	0.005	7.64	0.0076	
B	5			5.30	-i × 0.21	3.54	1.70	5.24	767.		
	10	3	20	-0.1	-i × 1.06	-4.7	+i × 1.23	0.14	3.0	3.1	3837
	11	-3/2	80.	6.65		5.56	0.22	5.78	0.0055		

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Table 2.2 (cont.)

Z	A	Spin	Relative abundance	Coherent scattering length (10 ⁻¹⁵ m)	Incoherent scattering length (10 ⁻¹⁵ m)	Coher.	Cross sections (in barns)		
							Incoh.	Scat.	Absorp.
C	6			6.6484		5.554	0.001	5.555	0.003 50
	12	0	98.9	6.6535	0	5.563	0	5.563	0.003 53
N	7			9.36		11.01	0.49	11.50	1.90
	14	1	99.63	9.37	1.98	11.03	0.49	11.52	1.91
O	8			5.805		4.235	0.000	4.235	0.000 19
	16	0	99.762	5.805	0	4.235	0	4.235	0.000 10
F	9	1/2	100	5.654	-0.082	4.017	0.0008	4.018	0.009 6
Ne	10			4.547		2.598	0.008	2.606	0.039
	20	0	90.51	4.610	0	2.671	0	2.671	0.037
Na	11	3/2	100	3.63	3.59	1.66	1.62	3.28	0.530
Mg	12			5.375		3.631	0.077	3.708	0.063
	24	0	78.99	5.68	0	4.05	0	4.05	0.051
Al	13	5/2	100	3.449	0.26	1.495	0.0085	1.504	0.231
Si	14			4.149		2.163	0.015	2.178	0.171
	28	0	92.23	4.106	0	2.119	0	2.119	0.177
P	15	1/2	100	5.13	0.22	3.307	0.006	3.313	0.172
S	16			2.847		1.0186	0.007	1.026	0.53
	32	0	95.02	2.804	0	0.9880	0	0.9880	0.54
Cl	17			9.5792		11.531	5.2	16.7	33.5
	35	3/2	75.77	11.66	6.0	17.08	4.5	21.6	44.1
	37	3/2	24.23	3.08	0.02	1.19	0.0001	1.19	0.433
Ar	18			1.909	0.458	0.22	0.68	0.675	
	40	0	99.600	1.83	0	0.42	0	0.42	0.660

Al: Probenbehälter

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Table 2.2 (cont.)

Z	A	Spin	Relative abundance	Coherent scattering length (10^{-15} m)	Incoherent scattering length (10^{-15} m)	Cross sections (in barns)				
						Coher.	Incoh.	Scat.	Absorp.	
K	19			3.71		1.73	0.25	1.98	2.1	
	39	3/2	93.258	3.79	1.4	1.81	0.25	2.06	2.1	
Ca	20			4.90		3.02	0.03	3.05	0.43	
	40	0	96.941	4.99	0	3.13	0	3.13	0.41	
Sc	21	45	-7/2	100	12.29	-6.0	19.0	4.5	23.5	27.2
Ti	22			-3.30		1.37	2.67	4.04	6.09	
	48	0	73.8	-5.84	0	4.29	0	4.29	7.84	
V	23			-0.3824		0.0184	5.187	5.205	5.08	
	51	-7/2	99.750	-0.4024	6.419	0.0203	5.178	5.198	4.9	
Cr	24			3.635		1.660	1.83	3.49	3.07	
	52	0	83.79	4.950	0	3.042	0	3.042	0.76	
Mn	25	55	-5/2	100	-3.73	1.79	1.75	0.40	2.15	13.3
Fe	26			9.54		11.44	0.39	11.83	2.56	
	56	0	91.7	10.03	0	12.64	0	12.64	2.59	
Co	27	59	-7/2	100	2.50	-6.2	0.79	4.8	5.6	37.18
Ni	28			10.3		13.3	5.2	18.5	4.49	
	58	0	68.27	14.4	0	26.1	0	26.1	4.6	
	60	0	26.10	2.8	0	0.99	0	0.99	2.9	
Cu	29			7.718		7.486	0.52	8.01	3.78	
	63	-3/2	69.17	6.43	0.22	5.2	0.0061	5.2	4.50	
	65	-3/2	30.83	10.61	1.79	14.1	0.40	14.5	2.17	

Definition of the Cross Sections

V: Bestimmung der Detektoreffizienz