



SECOND EDITION

Edited by

JAMES F. SHACKELFORD

WILLIAM ALEXANDER

JUN S. PARK

CRC

MATERIALS
SCIENCE
AND
ENGINEERING

HANDBOOK

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CRC

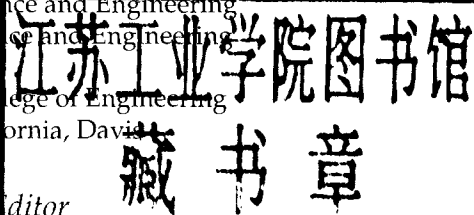
MATERIALS
SCIENCE
AND
ENGINEERING

HANDBOOK

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Properties of Materials

Selecting Properties of Materials

TABLE OF CONTENTS

PROPERTIES OF MATERIALS

Structure of Materials	1
Electronic Structure of Selected Elements	2
Available Stable Isotopes of the Elements	4
The Periodic Table of the Elements	12
Atomic and Ionic Radii of the Elements	18
Bond Length Values Between Elements	22
Carbon Bond Lengths	24
Carbon Bond Lengths in Polymers	27
Bond Angle Values Between Elements	29
Atomic Mass of Selected Elements	30
The Seven Crystal Systems	32
The Fourteen Bravais Lattices	33
Crystal Structure of the Elements	34
Structure of Selected Ceramics	38
Atomic Mass of Selected Elements	44
Solid Density of Selected Elements	46
Density of Selected Tool Steels	48
Density of Selected Alloy Cast Irons	49
Density of Selected Ceramics	50
Density of Glasses	53
Specific Gravity of Polymers	63
Composition of Materials	73
Composition Limits of Selected Tool Steels	74
Composition Limits of Selected Gray Cast Irons	76
Composition Limits of Selected Ductile Irons	77
Composition Ranges for Selected Malleable Irons	78
Composition Ranges for Selected Carbon Steels	78
Composition Ranges for Resulfurized Carbon Steels	79
Composition Ranges for Selected Alloy Steels	80
Composition Ranges for Selected Cast Aluminum Alloys	82
Composition Ranges for Selected Wrought Aluminum Alloys	86
Typical Composition of Selected Glass-Ceramics	88
Phase Diagram Sources	91
Phase Diagram Sources	92
Thermodynamic and Kinetic Data	93
Bond Strengths in Diatomic Molecules	94
Bond Strengths of Polyatomic Molecules	101
Heat of Formation of Selected Inorganic Oxides	106
Phase Change Thermodynamic Properties for The Elements	124
Phase Change Thermodynamic Properties of Oxides	132

Table of Contents (Continued)

Melting Point of Selected Elements	144
Melting Points of Elements and Inorganic Compounds	146
Melting Points of Ceramics	156
Heat of Fusion for Elements and Inorganic Compounds	162
Heats of Sublimation (at 25°C) of Metals and Their Oxides	172
Thermodynamic Coefficients	173
Thermodynamic Coefficients for Selected Elements	175
Thermodynamic Coefficients for Selected Oxides	184
Entropy of the Elements	197
Vapor Pressure of the Elements at Very Low Pressures	199
Vapor Pressure of the Elements at Moderate Pressures	201
Vapor Pressure of the Elements at High Pressures	204
Vapor Pressure of Elements and Inorganic Compounds	207
Values of the Error Function	212
Diffusion in Metallic Systems	213
Diffusion of Metals into Metals	236
Diffusion in some Non-Metallic Systems	248
Diffusion in Semiconductors	249
Thermal Properties of Materials	259
Specific Heat of Selected Elements at 25 °C	260
Heat Capacity of Selected Ceramics	262
Specific Heat of Selected Polymers	264
Thermal Conductivity of Metals	269
Thermal Conductivity of Alloy Cast Irons	277
Thermal Conductivity of Ceramics	278
Thermal Conductivity of Glasses	289
Thermal Conductivity of Cryogenic Insulation and Supports	292
Thermal Conductivity of Special Concretes	294
Thermal Conductivity of Polymers	295
Thermal Expansion of Tool Steels	302
Thermal Expansion of Alloy Cast Irons	303
Thermal Expansion of Ceramics	304
Thermal Expansion of Glasses	322
Thermal Expansion of Polymers	332
Thermal Expansion Coefficients for Materials used in Integrated Circuits	340
Temper Designation System for Aluminum Alloys	342
Tool Steel Softening After 100 Hours	343
Thermoplastic Polyester Softening with Temperature	344
Mechanical Properties of Materials	345
Viscosity of Glasses	348
Internal Friction of SiO ₂ Glass	364
Surface Tension of Elements at Melting Point	365

Table of Contents (Continued)

Surface Tension of Liquid Elements	372
Tensile Strength of Tool Steels	387
Tensile Strength of Gray Cast Irons	389
Tensile Strength of Ductile Irons	390
Tensile Strength of Malleable Iron Castings	391
Tensile Strength of Selected Aluminum Casting Alloys	392
Tensile Strength of Selected Wrought Aluminum Alloys	396
Tensile Strength of Ceramics	405
Tensile Strength of Glass	409
Tensile Strength of Polymers	411
Compressive Strength of Gray Cast Iron Bars	418
Compressive Strength of Ceramics	419
Yield Strength of Tool Steels	422
Yield Strength of Ductile Irons	424
Yield Strength of Malleable Iron Castings	425
Yield Strength of Cast Aluminum Alloys	426
Yield Strength of Wrought Aluminum Alloys	429
Yield Strength of Polymers	438
Compressive Yield Strength of Polymers	441
Flexural Strength of Polymers	444
Shear Strength of Wrought Aluminum Alloys	451
Torsion Shear Gray Cast Fe	458
Hardness of Tool Steels	459
Hardness of Gray Cast Irons	461
Hardness of Ductile Irons	462
Hardness of Malleable Iron Castings	463
Hardness of Wrought Aluminum Alloys	464
Hardness of Ceramics	470
Microhardness of Glass	476
Hardness of Polymers	478
Coefficient of Static Friction for Polymers	486
Abrasion Resistance of Polymers	488
Fatigue Strength of Wrought Aluminum Alloys	490
Reversed Bending Fatigue Limit of Gray Cast Iron Bars	495
Impact Energy of Tool Steels	496
Impact Strength of Polymers	498
Tension Modulus of Treated Ductile Irons	506
Tensile Modulus of Gray Cast Irons	506
Young's Modulus of Ceramics	507
Young's Modulus of Glass	513
Modulus of Elasticity in Tension for Polymers	515
Modulus of Elasticity in Compression for Polymers	519
Compression Modulus of Treated Ductile Irons	519
Bulk Modulus of Glass	520
Modulus of Elasticity in Flexure of Polymers	521

Table of Contents (Continued)

Shear Modulus of Glass	529
Torsional Modulus of Gray Cast Irons	531
Torsion Modulus of Treated Ductile Irons	531
Modulus of Rupture for Ceramics	532
Poisson's Ratio for Ceramics	537
Poisson's Ratio of Glass	540
Torsion Poisson's Ratio of Treated Ductile Irons	542
Compression Poisson's Ratio of Treated Ductile Irons	542
Elongation of Tool Steels	543
Elongation of Ductile Irons	545
Elongation of Malleable Iron Castings	546
Total Elongation of Cast Aluminum Alloys	547
Total Elongation of Polymers	551
Elongation at Yield of Polymers	557
Area Reduction of Tool Steels	559
Electrical Properties of Materials	561
Electrical Resistivity of Alloy Cast Irons	562
Resistivity of Ceramics	563
Volume Resistivity of Glass	568
Volume Resistivity of Polymers	582
Critical Temperature of Superconductive Elements	591
Dissipation Factor for Polymers	592
Dielectric Strength of Polymers	600
Step Dielectric Strength of Polymers	608
Dielectric Constant of Polymers	610
Dielectric Breakdown of Polymers	618
Tangent Loss in Glass	619
Electrical Permittivity of Glass	625
Arc Resistance of Selected Polymers	631
Optical Properties of Materials	637
Transmission Range of Optical Materials	638
Transparency of Polymers	640
Refractive Index of Polymers	645
Dispersion of Optical Materials	649
Chemical Properties of Materials	657
Water Absorption of Polymers	658
Standard Electromotive Force Potentials	666
Galvanic Series of Metals	683
Galvanic Series of Metals in Sea Water	685
Corrosion Rate of Metals in Acidic Solutions	688
Corrosion Rate of Metals in Neutral and Alkaline Solutions	689
Corrosion Rate of Metals in Air	690

Table of Contents (Continued)

Corrosion Rates of 1020 Steel at 70°F	691
Corrosion Rates of Grey Cast Iron at 70°F	702
Corrosion Rates of Ni-Resist Cast Iron at 70°F	712
Corrosion Rates of 12% C Steel at 70°F	721
Corrosion Rates of 14% Si Iron at 70°F	732
Corrosion Rates of 17% Cr Steel at 70°F	743
Corrosion Rates of Stainless Steel 301 at 70°F	752
Corrosion Rates of Stainless Steel 316 at 70°F	763
Corrosion Rates of Aluminum at 70°F	774
Corrosion Rates of 70-30 Brass at 70°F	785
Corrosion Rates of Copper, Sn-Braze, Al-Braze at 70°F	796
Corrosion Rates of Hastelloy at 70°F	807
Corrosion Rates of Inconel at 70°F	817
Corrosion Rates of Lead at 70°F	827
Corrosion Rates of Monel at 70°F	837
Corrosion Rates of Nickel at 70°F	848
Corrosion Rates of Silicon Bronze at 70°F	859
Corrosion Rates of Titanium at 70°F	870
Flammability of Polymers	876

SELECTION OF MATERIALS

Selection of Structural Properties	S-1
Selecting Atomic Radii of the Elements	S-2
Selecting Ionic Radii of the Elements	S-4
Selecting Bond Lengths Between Elements	S-6
Selecting Bond Angles Between Elements	S-8
Selecting Density of the Elements	S-9
Selection of Thermodynamic Properties	S-13
Selecting Bond Strengths in Diatomic Molecules	S-14
Selecting Bond Strengths of Polyatomic Molecules	S-22
Selecting Heat of Formation of Inorganic Oxides	S-27
Selecting Specific Heat of the Elements at 25 °C	S-36
Selecting Melting Points of The Elements	S-38
Selecting Melting Points of Elements and Inorganic Compounds	S-40
Selecting Melting Points of Ceramics	S-54
Selecting Heat of Fusion For Elements and Inorganic Compounds	S-60
Selecting Entropy of the Elements	S-74
Selecting Diffusion Activation Energy in Metallic Systems	S- 76

Table of Contents (Continued)

Selection of Thermal Properties	S-93
Selecting Specific Heat of Elements	S-94
Selecting Specific Heat of Polymers	S-96
Selecting Thermal Conductivity of Metals	S-100
Selecting Thermal Conductivity of Metals at Temperature	S-133
Selecting Thermal Conductivity of Alloy Cast Irons	S-168
Selecting Thermal Conductivity of Ceramics	S-169
Selecting Thermal Conductivity of Ceramics at Temperature	S-179
Selecting Thermal Conductivity of Polymers	S-189
Selecting Thermal Expansion of Tool Steels	S-194
Selecting Thermal Expansion of Tool Steels at Temperature	S-197
Selecting Thermal Expansion of Alloy Cast Irons	S-200
Selecting Thermal Expansion of Ceramics	S-201
Selecting Thermal Expansion of Glasses	S-216
Selecting Thermal Expansion of Polymers	S-226
Selecting Thermal Expansion Coefficients for Materials used in Integrated Circuits	S-231
Selecting Thermal Expansion Coefficients for Materials used in Integrated Circuits at Temperature	S-236
Selection of Mechanical Properties	S-241
Selecting Tensile Strength of Tool Steels	S-244
Selecting Tensile Strength of Gray Cast Irons	S-246
Selecting Tensile Strength of Ductile Irons	S-247
Selecting Tensile Strengths of Malleable Iron Castings	S-248
Selecting Tensile Strengths of Aluminum Casting Alloys	S-249
Selecting Tensile Strengths of Wrought Aluminum Alloys	S-252
Selecting Tensile Strengths of Ceramics	S-260
Selecting Tensile Strengths of Glass	S-264
Selecting Tensile Strengths of Polymers	S-266
Selecting Compressive Strengths of Gray Cast Iron Bars	S-271
Selecting Compressive Strengths of Ceramics	S-272
Selecting Compressive Strengths of Polymers	S-275
Selecting Yield Strengths of Tool Steels	S-278
Selecting Yield Strengths of Ductile Irons	S-280
Selecting Yield Strengths of Malleable Iron Castings	S-281
Selecting Yield Strengths of Cast Aluminum Alloys	S-282
Selecting Yield Strengths of Wrought Aluminum Alloys	S-285
Selecting Yield Strengths of Polymers	S-293
Selecting Compressive Yield Strengths of Polymers	S-295
Selecting Flexural Strengths of Polymers	S-297
Selecting Shear Strengths of Wrought Aluminum Alloys	S-302
Selecting Torsional Shear Strengths of Gray Cast Iron Bars	S-309
Selecting Hardness of Tool Steels	S-310
Selecting Hardness of Gray Cast Irons	S-312

Table of Contents (Continued)

Selecting Hardness of Ductile Irons	S-313
Selecting Hardness of Malleable Iron Castings	S-314
Selecting Hardness of Wrought Aluminum Alloys	S-315
Selecting Hardness of Ceramics	S-320
Selecting Microhardness of Glass	S-326
Selecting Hardness of Polymers	S-327
Selecting Coefficients of Static Friction for Polymers	S-333
Selecting Abrasion Resistance of Polymers	S-334
Selecting Fatigue Strengths of Wrought Aluminum Alloys	S-336
Selecting Reversed Bending Fatigue Limits of Gray Cast Iron Bars	S-340
Selecting Impact Energy of Tool Steels	S-341
Selecting Impact Strengths of Polymers	S-342
Selecting Tensile Moduli of Treated Ductile Irons	S-348
Selecting Tensile Moduli of Gray Cast Irons	S-348
Selecting Young's Moduli of Ceramics	S-349
Selecting Young's Moduli of Glass	S-354
Selecting Moduli of Elasticity in Tension for Polymers	S-356
Modulus of Elasticity in Compression for Polymers	S-359
Selecting Compression Moduli of Treated Ductile Irons	S-359
Selecting Bulk Moduli of Glass	S-360
Selecting Moduli of Elasticity in Flexure of Polymers	S-361
Selecting Shear Moduli of Glass	S-367
Selecting Torsional Moduli of Treated Ductile Irons	S-369
Selecting Torsional Moduli of Gray Cast Irons	S-369
Selecting Moduli of Rupture for Ceramics	S-370
Selecting Poisson's Ratios for Ceramics	S-374
Selecting Poisson's Ratios of Glass	S-376
Selecting Torsion Poisson's Ratios of Treated Ductile Irons	S-378
Selecting Compression Poisson's Ratios of Treated Ductile Irons	S-378
Selecting Elongation of Tool Steels	S-379
Selecting Elongation of Ductile Irons	S-381
Selecting Elongation of Malleable Iron Castings	S-382
Selecting Total Elongation of Cast Aluminum Alloys	S-383
Selecting Total Elongation of Polymers	S-386
Selecting Elongation at Yield of Polymers	S-391
Selecting Area Reduction of Tool Steels	S-392
Selection of Electrical Properties	S-395
Selecting Electrical Resistivity of Alloy Cast Irons	S-396
Selecting Resistivity of Ceramics	S-397
Selecting Volume Resistivity of Glass	S-402
Selecting Volume Resistivity of Polymers	S-415
Selecting Critical Temperature of Superconductive Elements	S-421
Selecting Dissipation Factor for Polymers @ 60 Hz	S-422
Selecting Dissipation Factor for Polymers @ 10^6 Hz	S-427

Table of Contents (Continued)

Selecting Dielectric Strength of Polymers	S-432
Selecting Dielectric Constants of Polymers at 60 Hz	S-438
Selecting Dielectric Constants of Polymers at 10^6 Hz	S-444
Selecting Tangent Loss in Glass	S-449
Selecting Tangent Loss in Glass by Temperature	S-454
Selecting Tangent Loss in Glass by Frequency	S-459
Selecting Electrical Permittivity of Glass	S-464
Selecting Electrical Permittivity of Glass by Frequency	S-470
Selecting Arc Resistance of Polymers	S-476
Selection of Optical Properties	S-481
Selecting Transmission Range of Optical Materials	S-482
Selecting Transparency of Polymers	S-484
Selecting Refractive Indices of Glasses	S-488
Selecting Refractive Indices of Polymers	S-494
Selection of Chemical Properties	S-497
Selecting Water Absorption of Polymers	S-498
Selecting Iron Alloys in 10% Corrosive Medium	S-504
Selecting Iron Alloys in 100% Corrosive Medium	S-519
Selecting Nonferrous Metals for use in a 10% Corrosive Medium	S-536
Selecting Nonferrous Metals for use in a 100% Corrosive Medium	S-551
Selecting Corrosion Rates of Metals	S-569
Selecting Corrosion Rates of Metals in Corrosive Environments	S-574
Selecting Flammability of Polymers	S-579

List of Sections

PROPERTIES OF MATERIALS

Structure of Materials	1
Composition of Materials	73
Phase Diagram Sources	91
Thermodynamic and Kinetic Data	93
Thermal Properties of Materials	259
Mechanical Properties of Materials	345
Electrical Properties of Materials	561
Optical Properties of Materials	637
Chemical Properties of Materials	657

SELECTION OF MATERIALS

Selection of Structural Properties	S-1
Selection of Thermodynamic Properties	S-13
Selection of Thermal Properties	S-93
Selection of Mechanical Properties	S-241
Selection of Electrical Properties	S-395
Selection of Optical Properties	S-481
Selection of Chemical Properties	S-497

Structure of Materials

Electronic Structure of Selected Elements	2
Available Stable Isotopes of the Elements	4
The Periodic Table of the Elements	12
Atomic and Ionic Radii of the Elements	18
Bond Length Values Between Elements	22
Carbon Bond Lengths	24
Carbon Bond Lengths in Polymers	27
Bond Angle Values Between Elements	29
Atomic Mass of Selected Elements	30
The Seven Crystal Systems	32
The Fourteen Bravais Lattices	33
Crystal Structure of the Elements	34
Structure of Selected Ceramics	38
Atomic Mass of Selected Elements	44
Solid Density of Selected Elements	46
Density of Selected Tool Steels	48
Density of Selected Alloy Cast Irons	49
Density of Selected Ceramics	50
Density of Glasses	53
Specific Gravity of Polymers	63

ELECTRONIC STRUCTURE OF SELECTED ELEMENTS

At. No.	Element	Sym	Electronic Configuration																	
			1s	2s	2p	3s	3p	3d	4s	4p	4d	4f	5s	5p	5d	5f	6s	6p	6d	7s
1	Hydrogen	H	1																	
2	Helium	He	2																	
3	Lithium	Li	.	1																
4	Beryllium	Be	.	2																
5	Boron	B	.	2	1															
6	Carbon	C	.	2	2															
7	Nitrogen	N	.	2	3															
8	Oxygen	O	.	2	4															
9	Fluorine	F	.	2	5															
10	Neon	N	.	2	6															
11	Sodium	Na	.	.		1														
12	Magnesium	Mg	.	.	.	2														
13	Aluminum	Al	.	.	.	2	1													
14	Silicon	Si	.	.	.	2	2													
15	Phosphorus	P	.	.	.	2	3													
16	Sulfur	S	.	.	.	2	4													
17	Chlorine	Cl	.	.	.	2	5													
18	Argon	Ar	.	.	.	2	6													
19	Potassium	K	.	.	.	.	.			1									
20	Calcium	Ca	.	.	.	.	.			2									
21	Scandium	Sc	.	.	.	.	.	1	2										
22	Titanium	Ti	.	.	.	.	.	2	2										
23	Vanadium	V	.	.	.	.	.	3	2										
24	Chromium	Cr	.	.	.	.	.	5	1										
25	Manganese	Mn	.	.	.	.	.	5	2										
26	Iron	Fe	.	.	.	.	.	6	2										
27	Cobalt	Co	.	.	.	.	.	7	2										
28	Nickel	Ni	.	.	.	.	.	8	2										
29	Copper	Cu	.	.	.	.	.	10	1										
30	Zinc	Zn	.	.	.	.	.	10	2										
31	Gallium	Ga	.	.	.	.	.	10	2	1									
32	Germanium	Ge	.	.	.	.	.	10	2	2									
33	Arsenic	As	.	.	.	.	.	10	2	3									
34	Selenium	Se	.	.	.	.	.	10	2	4									
35	Bromine	Br	.	.	.	.	.	10	2	5									
36	Krypton	Kr	.	.	.	.	.	10	2	6									
37	Rubidium	Rb	.	.	.	.	.	.	.	.			1						
38	Strontium	Sr	.	.	.	.	.	.	.	.			2						
39	Yttrium	Y	.	.	.	.	.	.	.	.	1		2						
40	Zirconium	Zr	.	.	.	.	.	.	.	.	2		2						
41	Niobium	Nb	.	.	.	.	.	.	.	.	4		1						
42	Molybdenum	Mo	.	.	.	.	.	.	.	.	5		1						
43	Technetium	Tc	.	.	.	.	.	.	.	.	6		1						
44	Ruthenium	Ru	.	.	.	.	.	.	.	.	7		1						
45	Rhodium	Rh	.	.	.	.	.	.	.	.	8		1						
46	Palladium	Pd	.	.	.	.	.	.	.	.	10								
47	Silver	Ag	.	.	.	.	.	.	.	.	10		1						
48	Cadmium	Cd	.	.	.	.	.	.	.	.	10		2						
49	Indium	In	.	.	.	.	.	.	.	.	10		2	1					
50	Tin	Sn	.	.	.	.	.	.	.	.	10		2	2					
51	Antimony	Sb	.	.	.	.	.	.	.	.	10		2	3					
52	Tellurium	Te	.	.	.	.	.	.	.	.	10		2	5					
53	Iodine	I	.	.	.	.	.	.	.	.	10		2	5					
54	Xenon	Xe	.	.	.	.	.	.	.	.	10		2	6					

Electronic Structure Of Selected Elements (Continued)

At. No.	Element	Sym	Electronic Configuration																	
			1s	2s	2p	3s	3p	3d	4s	4p	4d	4f	5s	5p	5d	5f	6s	6p	6d	7s
55	Cesium	Ce	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1			
56	Barium	Ba	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2			
57	Lantium	La	.	.	.	.	.	.	.	.	.	.	.	.	1	.	2			
58	Cerium	Ce	.	.	.	.	.	.	.	.	.	2	.	.	.	.	2			
59	Praseodymium	Pr	.	.	.	.	.	.	.	.	.	3	.	.	.	.	2			
60	Neodymium	Nd	.	.	.	.	.	.	.	.	.	4	.	.	.	.	2			
61	Promethium	Pm	.	.	.	.	.	.	.	.	.	5	.	.	.	.	2			
62	Samarium	Sm	.	.	.	.	.	.	.	.	.	6	.	.	.	.	2			
63	Europium	Eu	.	.	.	.	.	.	.	.	.	7	.	.	.	.	2			
64	Gadolinium	Gd	.	.	.	.	.	.	.	.	.	7	.	.	1	.	2			
65	Terbium	Tb	.	.	.	.	.	.	.	.	.	9	.	.	.	.	2			
66	Dysprosium	Dy	.	.	.	.	.	.	.	.	.	10	.	.	.	.	2			
67	Holmium	Ho	.	.	.	.	.	.	.	.	.	11	.	.	.	.	2			
68	Erbium	Er	.	.	.	.	.	.	.	.	.	12	.	.	.	.	2			
69	Thulium	Tm	.	.	.	.	.	.	.	.	.	13	.	.	.	.	2			
70	Ytterbium	Yb	.	.	.	.	.	.	.	.	.	14	.	.	.	.	2			
71	Lutetium	Lu	.	.	.	.	.	.	.	.	.	14	.	.	1	.	2			
72	Hafnium	Hf	.	.	.	.	.	.	.	.	.	14	.	.	2	.	2			
73	Tantalum	Ta	.	.	.	.	.	.	.	.	.	14	.	.	3	.	2			
74	Tungsten	W	.	.	.	.	.	.	.	.	.	14	.	.	4	.	2			
75	Rhenium	Re	.	.	.	.	.	.	.	.	.	14	.	.	5	.	2			
76	Osmium	Os	.	.	.	.	.	.	.	.	.	14	.	.	6	.	2			
77	Iridium	Ir	.	.	.	.	.	.	.	.	.	14	.	.	9	.				
78	Platinum	Pt	.	.	.	.	.	.	.	.	.	14	.	.	9	.	1			
79	Gold	Au	.	.	.	.	.	.	.	.	.	14	.	.	10	.	1			
80	Mercury	Hg	.	.	.	.	.	.	.	.	.	14	.	.	10	.	2			
81	Thallium	Tl	.	.	.	.	.	.	.	.	.	14	.	.	10	.	2	1		
82	Lead	Pb	.	.	.	.	.	.	.	.	.	14	.	.	10	.	2	2		
83	Bismuth	Bi	.	.	.	.	.	.	.	.	.	14	.	.	10	.	2	3		
84	Polonium	Po	.	.	.	.	.	.	.	.	.	14	.	.	10	.	2	4		
85	Asatine	At	.	.	.	.	.	.	.	.	.	14	.	.	10	.	2	5		
86	Radon	Rn	.	.	.	.	.	.	.	.	.	14	.	.	10	.	2	6		
87	Francium	Fr	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	
88	Radium	Ra	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	
89	Actinium	Ac	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	2
90	Thorium	Th	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2	2
91	Protoactinium	Pa	.	.	.	.	.	.	.	.	.	.	.	.	2	.	.	.	1	2
92	Uranium	U	.	.	.	.	.	.	.	.	.	.	.	.	3	.	.	.	1	2
93	Neptunium	Np	.	.	.	.	.	.	.	.	.	.	.	.	4	.	.	.	1	2
94	Plutonium	Pu	.	.	.	.	.	.	.	.	.	.	.	.	6	.	.	.		2
95	Americium	Am	.	.	.	.	.	.	.	.	.	.	.	.	7	.	.	.		2
96	Curium	Cm	.	.	.	.	.	.	.	.	.	.	.	.	7	.	.	.	1	2
97	Berkelium	Bk	.	.	.	.	.	.	.	.	.	.	.	.	9	.	.	.		2
98	Californium	Cf	.	.	.	.	.	.	.	.	.	.	.	.	10	.	.	.		2
99	Einsteinium	Es	.	.	.	.	.	.	.	.	.	.	.	.	11	.	.	.		2
100	Fermium	Fm	.	.	.	.	.	.	.	.	.	.	.	.	12	.	.	.		2
101	Mendelevium	Md	.	.	.	.	.	.	.	.	.	.	.	.	13	.	.	.		2
102	Nobelium	No	.	.	.	.	.	.	.	.	.	.	.	.	14	.	.	.		2
103	Lawrencium	Lw	.	.	.	.	.	.	.	.	.	.	.	.	14	.	.	.	1	2

AVAILABLE STABLE ISOTOPES OF THE ELEMENTS

Element	Mass No.	Natural Abundance (%)	Element	Mass No.	Natural Abundance (%)
Hydrogen	1	99.985	Sodium	23	100.0
	2	0.015			
Helium	3	0.00013	Magnesium	24	78.70
	4	≈100.0		25	10.13
				26	11.17
Lithium	6	7.42	Aluminum	27	100.0
	7	92.58			
Beryllium	9	100.0	Silicon	28	92.21
				29	4.70
				30	3.09
Boron	10	19.78	Phosphorus	31	100.0
	11	80.22			
Carbon	12	98.89	Sulfur	32	95.0
	13	1.11		33	0.76
Nitrogen	14	99.63		34	4.22
	15	0.37		36	0.014
Oxygen	16	99.76	Chlorine	35	75.53
	17	0.04		37	24.47
	18	0.20	Argon	36	0.34
Fluorine	19	100.0		38	0.06
				40	99.60
Neon	20	90.92			
	21	0.26			
	22	8.82			