

Silicon ${}_{14}\text{Si}^{28.086}$

Discovered in 1824 by J.J. Berzelius at Stockholm, Sweden.

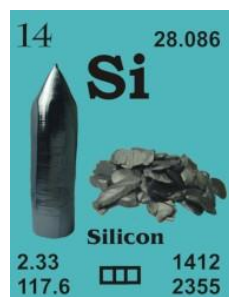
[Latin, silicis = flint]

French: Silicium

German: Silizium

Italian: Silicio

Spanish: Silicio



Atomic number	14
Density in g/cm ³	2.33
Atomic radius in pm	111
Atomic weight	28.086
Melting point in °C	1412
Boiling point in °C	2355

Description: Black amorphous silicon is obtained by the reduction of sand (SiO_2) with carbon. Ultrapure crystals of silicon have a blue-grey metallic sheen. Bulk silicon is unreactive towards oxygen, water and acids (except HF), but dissolves in hot alkalis. Silicon is used in semiconductors, alloys and polymers.

SILICON SINGLE CRYSTAL PROPERTIES

State:	single crystal
Crystal structure:	diamond
Production method:	Czochralski, Floating zone
Standard size:	Diameter 20–80mm thickness 1mm
Orientation:	(110) and (111)
Orientation accuracy:	<2°, <1°, <0.4° or <0.1°
Polishing:	as cut, one or two sides polished
Roughness of surface:	<0.03µm
Purity:	99.999%
	C 3
	H < 1
	O 9
	N < 5
	Cu 1.60
	Fe 1.80
	Ni < 1
	Pb 0.30
	Si 0.30
	Ga, Hf and Ta are below the detection limit
Density:	2.33 g/cm ³
Melting point:	1409.85 °C / 1683 °K
Boiling point:	2354.85 °C / 2628 °K
Molar volume:	12.06 cm ³
Thermal conductivity:	148 [300 K] Wm ⁻¹ K ⁻¹

Typical analysis (ppm):



Coefficient of linear thermal expansion:	$4.2 \times 10^{-6} \text{ K}^{-1}$
Electrical resistivity:	$0.001 \times 10^{-8} \Omega \cdot \text{m} [273 \text{ K}]$
Mass magnetic susceptibility:	$-1.8 \times 10^{-9} (\text{s}) \text{ kg}^{-1} \text{m}^3$
Young's modulus:	113 GPa
Rigidity modulus:	39.7 GPa
Bulk modulus:	n.a. GPa
Poisson's ratio:	0.05–0.42
Radii:	Si4+ 26; Si4– 271 atomic 117; covalent 117; van de
Electronegativity:	1.90 (Pauling); 1.74 (Allred); 4.77 eV (absolute)
Effective nuclear charge:	4.15 (Slater); 4.29 (Clementi); 4.48 (Froese-Fischer)
Number of Isotopes (incl. nuclear isomers):	11
Isotope mass range:	24 → 34
Crystal structure, (cell dimensions / pm), space group	diamond
X-ray diffraction: mass absorption coefficients:	CuK α 60.6 (μ/r) / $\text{cm}^2 \text{g}^{-1}$ MoK α 6.44 (μ/r) / $\text{cm}^2 \text{g}^{-1}$
Neutron scattering length:	$0.41543 \text{ b}/10^{-12} \text{ cm}$
Thermal neutron capture cross-section:	0.171 sa / barns

