Stable Isotopes of Bismuth

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Nuclear Spin
Bi-209	83	126	208.980384	100.00%	9/2-

In early times, bismuth was often confused with tin and lead because of its similarities to those elements. In 1753, Claude Geoffroy the Younger demonstrated its distinctness from lead. It takes its name from the German word *bisemutum.* Miners in the age of alchemy also gave bismuth the name *tectum argenti,* or "silver being made," in the sense of silver still in the process of being formed within the earth.

Bismuth is a crystalline, brittle, soft metal, grayish-white with a pinkish tinge and a metallic luster. It has a rhombohedral crystal system. It is soluble in nitric and hydrochloric acids. Its thermal conductivity is lowest of all metals except mercury. It forms trivalent and pentavalent compounds (the trivalent compounds are more common). Many of bismuth's chemical properties are similar to those of other elements in its group, especially arsenic and antimony. It is stable in both dry and moist air at ordinary temperatures; at elevated temperatures, the vapors of the metal combine rapidly with oxygen, forming bismuth trioxide. Bismuth reacts with chlorine, bromine and iodine vapors, forming their bismuth halides.

The major commercial applications of bismuth are as fusible alloys and in pharmaceuticals. Some bismuth compounds also find catalytic applications in the manufacture of acrylic fibers. It is used in electric fuses, fusible boiler plugs, low-melting solders, thermoelectric materials and semiconductors, and as an additive to steel and other metals. Other compounds are used in medicine as antacids, antisyphilitics and anti-infectives, and in cosmetics such as lipstick, powder and eye shadow.

Properties of Bismuth

Name	Bismuth
Symbol	Bi
Atomic number	83
Atomic weight	208.98
Standard state	Solid at 298 °K
CAS Registry ID	7440-69-9
Group in periodic table	15
Group name	Pnictogen

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Properties of Bismuth (continued)

Period in periodic table	6
Block in periodic table	p-block
Color	Lustrous reddish-white
Classification	Metallic
Melting point	271 °C
Boiling point	1560 °C
Vaporization point	1564 ºC
Thermal conductivity	8.00 W/(m·K)
Electrical resistivity	106.80 μΩ·cm at 0 °C
Electronegativity	1.67
Specific heat	122.00 J/(kg·K)
Heat of vaporization	160.00 $kJ \cdot mol^{-1}$
Heat of fusion	10.90 $kJ \cdot mol^{-1}$
Density of liquid	10.05 g/cm^3 at 271 °C
Density of solid	9.79 g/cm^3
Electron configuration	$[Xe]4f^{14}5d^{10}6s^26p^3$
Atomic radius	1.88 Å (coordination number 12)
Atomic volume	21.30 cm^3/g-atom
Ionic radii in crystals	Bi^{3+}: 1.03 Å; Bi^{5+}: 0.76 Å (coordination number 6)
Ionization potentials	$Bi(^{+3})$: 25.56 eV and $Bi(^{+5})$: 56.0 eV
Electron affinity	0.946 eV
Oxidation states	+3, +5

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