

Barium

*Wikipedia is sustained by people like you. Please **donate** today.*

From Wikipedia, the free encyclopedia

Barium (pronounced /ˈbɛəriəm/) is a chemical element. It has the symbol **Ba**, and atomic number 56. Barium is a soft silvery metallic alkaline earth metal. It is never found in nature in its pure form due to its reactivity with air. Its oxide is historically known as baryta but it reacts with water and carbon dioxide and is not found as a mineral. The most common naturally occurring minerals are the very insoluble barium sulfate, BaSO₄ (barite), and barium carbonate, BaCO₃ (witherite). Benitoite is a rare gem containing barium.

Contents

- 1 Notable characteristics
- 2 Applications
- 3 History
- 4 Occurrence
- 5 Compounds
- 6 Isotopes
- 7 Precautions
- 8 References
- 9 External links

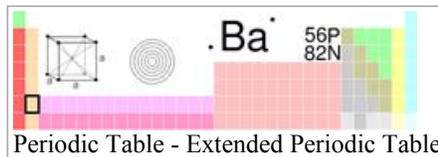
Notable characteristics

Barium is a metallic element that is chemically similar to calcium but more reactive. This metal oxidizes very easily when exposed to air and is highly reactive with water or alcohol, producing hydrogen gas. Burning in air or oxygen produces not just barium oxide (BaO) but also the peroxide. Simple compounds of this heavy element are notable for their high specific gravity. This is true of the most common barium-bearing mineral, its sulfate barite BaSO₄, also called 'heavy spar' due to the high density (4.5 g/cm³).

Applications

Barium has some medical and many industrial uses:

- Barium compounds, and especially barite (BaSO₄), are extremely important to the petroleum industry. Barite is used in drilling mud, a weighting agent in drilling new oil wells.
- Barium sulfate is used as a radiocontrast agent for X-ray imaging of the digestive system ("barium meals" and "barium enemas").
- Barium carbonate is a useful rat poison and can also be used in making bricks. Unlike the sulfate, the carbonate dissolves in stomach acid, allowing it to be poisonous.
- An alloy with nickel is used in spark plug wire.
- Barium oxide is used in a coating for the electrodes of fluorescent lamps, which facilitates the release of electrons.
- The metal is a "getter" in vacuum tubes, to remove the last traces of oxygen.
- Barium carbonate is used in glassmaking. Being a heavy element, barium increases the refractive index and luster of the glass.
- Barite is used extensively in rubber production.
- Barium nitrate and chlorate give green colors in fireworks.
- Impure barium sulfide phosphoresces after exposure to the light.
- Lithopone, a pigment that contains barium sulfate and zinc

56	caesium ← barium → lanthanum
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> Sr ↑ Ba ↓ Ra </div> <div style="text-align: center;">  <p>Periodic Table - Extended Periodic Table</p> </div> </div>	
General	
Name, Symbol, Number	barium, Ba, 56
Chemical series	alkaline earth metals
Group, Period, Block	2, 6, s
Appearance	silvery white <div style="text-align: right;"></div>
Standard atomic weight	137.327(7) g·mol ^{−1}
Electron configuration	[Xe] 6s ²
Electrons per shell	2, 8, 18, 18, 8, 2
Physical properties	
Phase	solid
Density (near r.t.)	3.51 g·cm ^{−3}
Liquid density at m.p.	3.338 g·cm ^{−3}
Melting point	1000 K (727 °C, 1341 °F)
Boiling point	2170 K (1897 °C, 3447 °F)
Heat of fusion	7.12 kJ·mol ^{−1}
Heat of vaporization	140.3 kJ·mol ^{−1}
Specific heat capacity	(25 °C) 28.07 J·mol ^{−1} ·K ^{−1}
Vapor pressure	
<i>P</i> (Pa)	1 10 100 1 k 10 k 100 k
at <i>T</i> (K)	911 1038 1185 1388 1686 2170
Atomic properties	
Crystal structure	cubic body centered
Oxidation states	2 (strongly basic oxide)
Electronegativity	0.89 (Pauling scale)
Ionization energies	1st: 502.9 kJ/mol 2nd: 965.2 kJ/mol 3rd: 3600 kJ/mol
Atomic radius	215 pm
Atomic radius (calc.)	253 pm
Covalent radius	198 pm
Miscellaneous	

sulfide, is a permanent white that has good covering power, and does not darken in when exposed to sulfides.

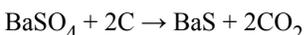
- Barium peroxide can be used as a catalyst to start an aluminothermic reaction when welding rail tracks together. It can also be used in green tracer ammunition.
- Barium titanate was proposed in 2007[2] to be used in next generation battery technology for electric cars.
- Barium Fluoride is used in infrared applications.
- Barium is a key element in YBCO superconductors.

History

Barium (Greek *barys*, meaning "heavy") was first identified in 1774 by Carl Scheele and extracted in 1808 by Sir Humphry Davy in England. The oxide was at first called barote, by Guyton de Morveau, which was changed by Antoine Lavoisier to baryta, from which "barium" was derived to describe the metal.

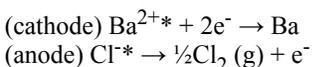
Occurrence

Because barium quickly becomes oxidized in air, it is difficult to obtain this metal in its pure form. It is primarily found in and extracted from the mineral barite which is crystallized barium sulfate. Because barite is so insoluble, it cannot be used directly for the preparation of other barium compounds. Instead, the ore is heated with carbon to reduce it to barium sulfide^[1]



The barium sulfide is then hydrolyzed or reacted with acids to form other barium compounds such as the chloride, nitrate, and carbonate.

Barium is commercially produced through the electrolysis of molten barium chloride (BaCl₂) *Isolation* (* follow):



Compounds

The most important compounds are barium peroxide, barium chloride, sulfate, carbonate, nitrate, and chlorate.

Isotopes

Naturally occurring barium is a mix of seven stable isotopes. There are twenty-two isotopes known, but most of these are highly radioactive and have half-lives in the several millisecond to several minute range. The only notable exceptions are ¹³³Ba which has a half-life of 10.51 years, and ^{137m}Ba (2.55 minutes).

Precautions

All water or acid soluble barium compounds are extremely poisonous. At low doses, barium acts as a muscle stimulant, while higher doses affect the nervous system, causing cardiac irregularities, tremors, weakness, anxiety, dyspnea and paralysis. This may be due to its ability to block potassium ion channels which are critical to the proper function of the nervous system.

Barium sulfate can be taken orally because it is highly insoluble in water, and is eliminated completely from the digestive tract. Unlike other heavy metals, barium does not bioaccumulate.^[2] However, inhaled dust containing barium compounds can accumulate in the lungs, causing a benign condition called baritosis.

Oxidation occurs very easily and, to remain pure, barium should be kept under a petroleum-based fluid (such as kerosene) or

Magnetic ordering	paramagnetic
Electrical resistivity	(20 °C) 332 nΩ·m
Thermal conductivity	(300 K) 18.4 W·m ^{−1} ·K ^{−1}
Thermal expansion	(25 °C) 20.6 μm·m ^{−1} ·K ^{−1}
Speed of sound (thin rod)	(20 °C) 1620 m/s
Young's modulus	13 GPa
Shear modulus	4.9 GPa
Bulk modulus	9.6 GPa
Mohs hardness	1.25
CAS registry number	7440-39-3

Selected isotopes

Main article: Isotopes of barium

iso	NA	half-life	DM	DE (MeV)	DP
¹³⁰ Ba	0.106%	¹³⁰ Ba is stable with 74 neutrons			
¹³² Ba	0.101%	¹³² Ba is stable with 76 neutrons			
¹³³ Ba	syn	10.51 y	ε	0.517	¹³³ Cs
¹³⁴ Ba	2.417%	¹³⁴ Ba is stable with 78 neutrons			
¹³⁵ Ba	6.592%	¹³⁵ Ba is stable with 79 neutrons			
¹³⁶ Ba	7.854%	¹³⁶ Ba is stable with 80 neutrons			
¹³⁷ Ba	11.23%	¹³⁷ Ba is stable with 81 neutrons			
¹³⁸ Ba	71.7%	¹³⁸ Ba is stable with 82 neutrons			

References

other suitable oxygen-free liquids that exclude air.

Barium acetate could lead to death in high doses. Marie Robards poisoned her father with the substance in Texas in 1993. She was tried and convicted in 1996.

References

- [^] Toxicological Profile for Barium and Barium Compounds. Agency for Toxic Substances and Disease Registry, CDC. 2007. [1]
- [^] Toxicity Profiles, Ecological Risk Assessment | Region 5 Superfund | US EPA

External links

- WebElements.com – Barium
- Elementymology & Elements Multidict

Retrieved from "<http://en.wikipedia.org/wiki/Barium>"

Categories: [Chemical elements](#) | [Alkaline earth metals](#) | [Toxicology](#) | [Barium](#) | [Barium compounds](#) | [Barium minerals](#)

- This page was last modified on 22 May 2008, at 23:12.
- All text is available under the terms of the GNU Free Documentation License. (See **Copyrights** for details.) Wikipedia® is a registered trademark of the Wikimedia Foundation, Inc., a U.S. registered 501(c)(3) tax-deductible nonprofit charity.