Mercury

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Mercury is a chemical element with symbol **Hg** and atomic number 80. It is commonly known as **quicksilver** and was formerly named **hydrargyrum** (/haɪˈdrɑːrdʒərəm/).[3] A heavy, silvery d-block element, mercury is the only metallic element that is liquid at standard conditions for temperature and pressure; the only other element that is liquid under these conditions is bromine, though metals such as caesium, gallium, and rubidium melt just above room temperature.

Mercury occurs in deposits throughout the world mostly as cinnabar (mercuric sulfide). The red pigment vermilion is obtained by grinding natural cinnabar or synthetic mercuric sulfide.

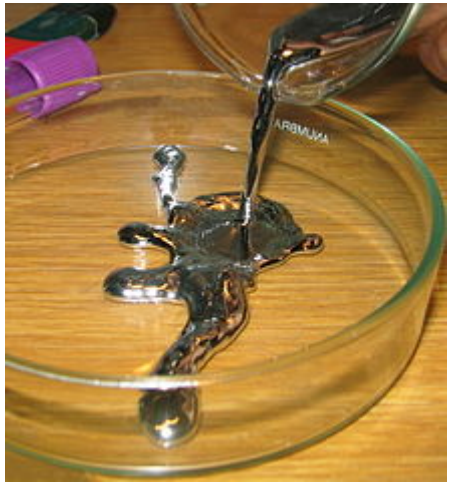
Mercury is used in thermometers, barometers, manometers, sphygmomanometers, float valves, mercury switches, mercury relays, fluorescent lamps and other devices, though concerns about the element's toxicity have led to mercury thermometers and sphygmomanometers being largely phased out in clinical environments in favor of alternatives such as alcohol- or galinstan-filled glass thermometers and thermistor- or infrared-based electronic instruments. Likewise, mechanical pressure gauges and electronic strain gauge sensors have replaced mercury sphygmomanometers. Mercury remains in use in scientific research applications and in amalgam for dental restoration in some locales. It is used in fluorescent lighting. Electricity passed through mercury vapor in a fluorescent lamp produces short-wave ultraviolet light which then causes the phosphor in the tube to fluoresce, making visible light.

Mercury poisoning can result from exposure to water-soluble forms of mercury (such as mercuric chloride or methylmercury), by inhalation of mercury vapor, or by ingesting any form of mercury.

Properties

Physical properties

Mercury, $_{80}$Hg



Spectral lines of mercury (UV not seen)

General properties

Name, symbol	mercury, Hg
Appearance	silvery

Mercury in the periodic table

Atomic number (*Z*)	80
Group, block	group 12, d-block
Period	period 6
Element category	□ transition metal, alternatively considered a post-transition metal
Standard atomic weight (±) (A_r)	200.592(3)[1]
Electron	[Xe] $4f^{14}$ $5d^{10}$ $6s^2$

A pound coin (density ~7.6 g/cm^3) floats in mercury due to the combination of the buoyant force and surface tension.

Mercury is a heavy, silvery-white liquid metal. Compared to other metals, it is a poor conductor of heat, but a fair conductor of electricity.[4]

It has a freezing point of −38.83 °C and a boiling point of 356.73 °C,[5][6][7] both the lowest of any metal.[8] Upon freezing, the volume of mercury decreases by 3.59% and its density changes from 13.69 g/cm^3 when liquid to 14.184 g/cm^3 when solid. The coefficient of volume expansion is 181.59×10^{-6} at 0 °C, 181.71×10^{-6} at 20 °C and 182.50×10^{-6} at 100 °C (per °C). Solid mercury is malleable and ductile and can be cut with a knife.[9]

A complete explanation of mercury's extreme volatility delves deep into the realm of quantum physics, but it can be summarized as follows: mercury has a unique electron configuration where electrons fill up all the available 1s, 2s, 2p, 3s, 3p, 3d, 4s, 4p, 4d, 4f, 5s, 5p, 5d, and 6s subshells. Because this configuration strongly resists removal of an electron, mercury behaves similarly to noble gases, which form weak bonds and hence melt at low temperatures.

The stability of the 6s shell is due to the presence of a filled 4f shell. An f shell poorly screens the nuclear charge that increases the attractive Coulomb interaction of the 6s shell and the nucleus (see lanthanide contraction). The absence of a filled inner *f* shell is the reason for the somewhat higher melting temperature of cadmium and zinc, although both these metals still melt easily and, in addition, have unusually low boiling points.[5][6]

Chemical properties

configuration	
per shell	2, 8, 18, 32, 18, 2
Physical properties	
Phase	liquid
Melting point	234.3210 K (−38.8290 °C, −37.8922 °F)
Boiling point	629.88 K (356.73 °C, 674.11 °F)
Density near r.t.	13.534 g/cm^3
Triple point	234.3156 K, 1.65×10^{-7} kPa
Critical point	1750 K, 172.00 MPa
Heat of fusion	2.29 kJ/mol
Heat of vaporization	59.11 kJ/mol
Molar heat capacity	27.983 J/(mol·K)

Vapor pressure

P (Pa)	**1**	**10**	**100**	**1 k**	**10 k**	**100 k**
at T (K)	315	350	393	449	523	629

Atomic properties	
Oxidation states	**2** (mercuric), 1 (mercurous), −2 (a mildly basic oxide)
Electronegativity	Pauling scale: 2.00
Ionization energies	1st: 1007.1 kJ/mol 2nd: 1810 kJ/mol 3rd: 3300 kJ/mol
Atomic radius	empirical: 151 pm
Covalent radius	132±5 pm
Van der Waals radius	155 pm
Miscellanea	

Mercury does not react with most acids, such as dilute sulfuric acid, although oxidizing acids such as concentrated sulfuric acid and nitric acid or aqua regia dissolve it to give sulfate, nitrate, and chloride. Like silver, mercury reacts with atmospheric hydrogen sulfide. Mercury reacts with solid sulfur flakes, which are used in mercury spill kits to absorb mercury (spill kits also use activated carbon and powdered zinc).[10]

Amalgams


Mercury-discharge spectral calibration lamp

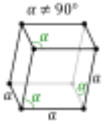
Mercury dissolves many other metals such as gold and silver to form amalgams. Iron is an exception, and iron flasks have traditionally been used to trade mercury. Several other first row transition metals with the exception of manganese, copper and zinc are reluctant to form amalgams. Other elements that do not readily form amalgams with mercury include platinum.[11][12] Sodium amalgam is a common reducing agent in organic synthesis, and is also used in high-pressure sodium lamps.

Mercury readily combines with aluminium to form a mercury-aluminium amalgam when the two pure metals come into contact. Since the amalgam destroys the aluminium oxide layer which protects metallic aluminium from oxidizing in-depth (as in iron rusting), even small amounts of mercury can seriously corrode aluminium. For this reason, mercury is not allowed aboard an aircraft under most circumstances because of the risk of it forming an amalgam with exposed aluminium parts in the aircraft.[13]

Mercury embrittlement is the most common type of liquid metal embrittlement.

Isotopes

There are seven stable isotopes of mercury with ^{202}Hg being the most abundant (29.86%). The longest-lived radioisotopes are ^{194}Hg with a half-life of 444 years, and ^{203}Hg with a half-life of 46.612 days. Most of the remaining

Crystal structure	rhombohedral 
Speed of sound	liquid: 1451.4 m/s (at 20 °C)
Thermal expansion	60.4 µm/(m·K) (at 25 °C)
Thermal conductivity	8.30 W/(m·K)
Electrical resistivity	961 nΩ·m (at 25 °C)
Magnetic ordering	diamagnetic[2]
CAS Number	7439-97-6
	History
Discovery	Ancient Chinese and Indians (before 2000 BCE)

Most stable isotopes of mercury

iso	NA	half-life	DM	DE (MeV)	DP
^{194}Hg	syn	444 y	ε	0.040	^{194}Au
^{195}Hg	syn	9.9 h	ε	1.510	^{195}Au
^{196}Hg	0.15%	is stable with 116 neutrons			
^{197}Hg	syn	64.14 h	ε	0.600	^{197}Au
^{198}Hg	10.04%	is stable with 118 neutrons			
^{199}Hg	16.94%	is stable with 119 neutrons			
^{200}Hg	23.14%	is stable with 120 neutrons			
^{201}Hg	13.17%	is stable with 121 neutrons			
^{202}Hg	29.74%	is stable with 122 neutrons			
^{203}Hg	syn	46.612 d	β−	0.492	^{203}Tl
^{204}Hg	6.82%	is stable with 124 neutrons			

radioisotopes have half-lives that are less than a day. ^{199}Hg and ^{201}Hg are the most often studied NMR-active nuclei, having spins of $^{1}/_{2}$ and $^{3}/_{2}$ respectively.[4]

Source

- Wikipedia: Mercury (https://en.wikipedia.org/wiki/Mercury_(element))