

## Stable isotopes of hydrogen available from ISOFLEX

Isotope	Z(p)	N(n)	Atomic Mass	Natural Abundance	Enrichment Level	Chemical Form
Deuterium	1	1	2.014101778	0.0115%	>99.00%	Heavy Water



Hydrogen was discovered in 1766 by Henry Cavendish, who also independently discovered nitrogen. Its name derives from the Greek words *hydro* and *genes*, meaning “water-generator” or “water-creator.”

The most abundant element in the universe, hydrogen is a colorless, odorless, tasteless gas that is also flammable, burning in the air with a popping sound. It combines explosively with oxygen at ordinary temperatures in the presence of finely divided metals. Explosion of its mixture with chlorine is detonated by sunlight, heat or spark. It also combines explosively with halogens, and it autoignites at 574 °C.

Hydrogen is lighter than air and is slightly soluble in water. It forms the largest number of chemical compounds — more than any other element, including carbon — and is a component of all mineral acids, ammonia, natural gases and hydrocarbons, as well as a vast number of organic compounds, from simple alcohols and aldehydes to complex proteins, carbohydrates and chlorophyll.

The first hydrogen-filled balloon was invented by Jacques Charles in 1783. German count Ferdinand von Zeppelin later promoted the idea of rigid airships lifted by hydrogen that later were called *Zeppelins*, the first of which had its maiden flight in 1900. Hydrogen-lifted airships were used as observation platforms and bombers during World War I. Hydrogen has also been used as a coolant in turbogenerators, as battery fuel, for the processing of fossil fuels, in the production of ammonia, as a hydrogenating agent for food oils, and in the production of methanol. It is used as a tracer gas for minute leak detection, as a shielding gas in welding, and in cryogenic research.

## Properties of Hydrogen

<b>Name</b>	Hydrogen
<b>Symbol</b>	H
<b>Atomic number</b>	1
<b>Atomic weight</b>	1.0079
<b>Standard state</b>	Gas at 298 °K
<b>CAS Registry ID</b>	1333-74-0
<b>Group in periodic table</b>	1
<b>Group name</b>	None
<b>Period in periodic table</b>	1
<b>Block in periodic table</b>	s-block

## Properties of Hydrogen (continued)

<b>Color</b>	Colorless
<b>Classification</b>	Nonmetallic
<b>Melting point</b>	-259.14 °C
<b>Boiling point</b>	-252.87 °C
<b>Thermal conductivity</b>	0.1805 W/(m·K)
<b>Electronegativity</b>	2.20
<b>Heat of vaporization</b>	0.452 kJ·mol <sup>-1</sup>
<b>Heat of fusion</b>	0.558 kJ·mol <sup>-1</sup>
<b>Density of gas</b>	0.088 g/cm <sup>3</sup>
<b>Density of liquid</b>	0.00708 g/cm <sup>3</sup>
<b>Density of solid</b>	0.086 g/cm <sup>3</sup>
<b>Electron configuration</b>	1s <sup>1</sup>
<b>Lower explosive limit</b>	4%
<b>Upper explosive limit</b>	75%
<b>Oxidation states</b>	-1 and +1
<b>Critical temperature</b>	-240.18 °C
<b>Critical pressure</b>	12.76 atm
<b>Critical volume</b>	65 cm <sup>3</sup> /mo
<b>Velocity of sound</b>	1,269.5 m/sec at 0 °C
<b>Diffusion coefficient in air</b>	0.634 cm <sup>2</sup> /sec at 0 °C