

# Sulphur - S

## Chemical properties of sulphur - Health effects of sulphur - Environmental effects of sulphur

Atomic number	16
Atomic mass	32.06 g.mol <sup>-1</sup>
Electronegativity according to Pauling	2.5
Density	2.07 g.cm <sup>-3</sup> at 20 °C
Melting point	113 °C
Boiling point	445 °C
Vanderwaals radius	0.127 nm
Ionic radius	0.184 (-2) nm ; 0.029 (+6)
Isotopes	5
Electronic shell	[Ne] 3s <sup>2</sup> 3p <sup>4</sup>
Energy of first ionisation	999.3 kJ.mol <sup>-1</sup>
Energy of second ionisation	2252 kJ.mol <sup>-1</sup>
Energy of third ionisation	3357 kJ.mol <sup>-1</sup>
Standard potential	- 0.51 V
Discovered by	The ancients



## Sulphur

Sulphur is a multivalent non-metal, abundant, tasteless and odorless. In its native form sulphur is a yellow crystalline solid. In nature it occurs as the pure element or as sulfide and sulfate minerals. Although sulphur is infamous for its smell, frequently compare to rotten eggs, that odor is actually characteristic of hydrogen sulphide (H<sub>2</sub>S). The crystallography of sulphur is complex. Depending on the specific conditions, sulphur allotropes form several distinct crystal structures.

### Applications

The major derivative of sulphur is sulphuric acid (H<sub>2</sub>SO<sub>4</sub>), one of the most important elements used as an industrial raw material. Sulphur is also used in batteries, detergents, fungicides, manufacture of fertilizers, gun power, matches and fireworks. Other applications are making corrosion-resistant concrete which has great strength and is first resistant, for solvents and in a host of other products of the chemical and pharmaceutical industries.

### Sulphur in the environment

Life on Earth may have been possible because of sulphur. Conditions in the early seas were such that simple chemical reactions could have generate the range of amino acids that are the building blocks of life.

Sulphur occurs naturally near volcanoes. Native sulphur occurs naturally as massive deposits in Texas and Louisiana in the USA. Many sulphide minerals are known: pyrite and marcasite are iron sulphide ; stibnite is antimony sulphide; galena is lead sulphide; cinnabar is mercury sulphide and sphalerite is zinc sulphide. Other, more important, sulphide ores are chalcopyrite, bornite, penlandite, millerite and molybdenite.

The chief source of sulphur for industry is the hydrogen sulphide of natural gas, Canada is the main producer.

## Health effects of sulphur

All living things need sulphur. It is especially important for humans because it is part of the amino acid methionine, which is an absolute dietary requirement for us. The amino acid cysteine also contains sulphur. The average person takes in around 900 mg of sulphur per day, mainly in the form of protein.

Elemental sulphur is not toxic, but many simple sulphur derivates are, such as sulphur dioxide (SO<sub>2</sub>) and hydrogen sulfide.

Sulfur can be found commonly in nature as sulphides. During several processes sulfur bonds are added to the environment that are damaging to animals, as well as humans. These damaging sulphur bonds are also shaped in nature during various reactions, mostly when substances that are not naturally present have already been added. They are unwanted because of their unpleasant smells and are often highly toxic.

Globally sulphuric substances can have the following effects on human health:

- Neurological effects and behavioural changes
- Disturbance of blood circulation
- Heart damage
- Effects on eyes and eyesight
- Reproductive failure
- Damage to immune systems