Sulfur. The brimstone of the Bible, sulfur was most likely encountered by prehistoric humankind near geothermal sources such as volcanoes and geysers. Sulfur's two crystal forms, monoclinic and rhombic, both have a melting temperature just above the boiling point of water at one atmosphere. Under pressure, as under the earth, water temperature can exceed the melting temperature for sulfur. Since sulfur does not dissolve in water, the liquid sulfur immediately solidifies as it reaches the earth's surface, leaving the distinctive non-metal pale yellow brittle solid. The Frasch process for mining sulfur does exactly the same as the geothermal process. Superheated water under pressure is pumped into the earth and retrieved with melted sulfur in it, mimicking the natural process for sulfur exposure. There is another non-crystalline form of elemental sulfur that can be made by melting crystalline sulfur, but the amorphous allotrope is unstable, reverting to one of the crystalline forms on standing. Sulfur burns in air (the stone that burns) to form sulfur dioxide. This is the first step in the manufacture of sulfuric acid, by far the most used compound of sulfur. It has been said that the amount of sulfuric acid made is a good measure of the level of industrialization of a country. Sulfur is one of the main ingredients in the vulcanization of rubber.

Historical applications

In the late 18th century, furniture makers used molten sulfur to produce decorative inlays in their craft. Because of the sulfur dioxide produced during the process of melting sulfur, the craft of sulfur inlays was soon abandoned. Molten sulfur is sometimes still used for setting steel bolts into drilled concrete holes where high shock resistance is desired for floor-mounted equipment attachment points. Pure powdered sulfur was also used as a medicinal tonic and laxative. Sulfur was also used in baths for people who had seizures.

Fungicide and pesticide

Sulfur is one of the oldest fungicides and pesticides. Dusting sulfur, elemental sulfur in powdered form, is a common fungicide for grapes, strawberry, many vegetables and several other crops. It has a good efficacy against a wide range of powdery mildew diseases as well as black spot. In organic production, sulfur is the most important fungicide. It is the only fungicide used in organically farmed apple production against the main disease apple scab under colder conditions. Biosulfur (biologically produced elemental sulfur with hydrophilic characteristics) can be used well for these applications.

Standard-formulation dusting sulfur is applied to crops with a sulfur duster or from a dusting plane. Wettable sulfur is the commercial name for dusting sulfur formulated with additional ingredients to make it water soluble. It has similar applications, and is used as a fungicide against mildew and other mold-related problems with plants and soil.

Sulfur is also used as an "organic" (i.e. "green") insecticide (actually an acaricide) against ticks and mites. A common method of use is to dust clothing or limbs with sulfur powder. Some livestock owners set out a sulfur salt block as a salt lick.

Biological role

Main article: Sulfur assimilation

See sulfur cycle for more on the inorganic and organic natural transformations of sulfur.

Sulfur is an essential component of all living cells.

Inorganic sulfur forms a part of iron-sulfur clusters, and sulfur is the bridging ligand in the Cu_A site of cytochrome c oxidase, a basic substance involved in utilization of oxygen by all aerobic life.

Sulfur may also serve as chemical food source for some primitive organisms: some forms of bacteria use hydrogen sulfide (H_2S) in the place of water as the electron donor in a primitive photosynthesis-like process in which oxygen is the electron receptor. The photosynthetic green and purple sulfur bacteria and some chemolithotrophs use elemental oxygen to carry out such oxidization of hydrogen sulfide to produce elemental sulfur (S^o), oxidation state = 0. Primitive bacteria which live around deep ocean volcanic vents oxidize hydrogen sulfide in this way with oxygen: see giant tube worm for an example of large organisms (via bacteria) making metabolic use of hydrogen sulfide as food to be oxidized.

The so-called sulfur bacteria, by contrast, "breathe sulfate" instead of oxygen. They use sulfur as the electron acceptor, and reduce various oxidized sulfur compounds back into sulfide, often into hydrogen sulfide. They also can grow on a number of other partially oxidized sulfur compounds (e. g. thiosulfates, thionates, polysulfides, sulfites). The hydrogen sulfide produced by these bacteria is responsible for the smell of some intestinal gases and decomposition products.

Sulfur is a part of many bacterial defense molecules. For example, though sulfur is not a part of the lactam ring, it is a part of most beta lactam antibiotics, including the penicillins, cephalosporins, and monobactams.

Sulfur is absorbed by plants via the roots from soil as the sulfate ion and reduced to sulfide before it is incorporated into cysteine and other organic sulfur compounds (see sulfur assimilation for details of this process).

Sulfur is regarded as secondary nutrient although plant requirements for sulfur are equal to and sometimes exceed those for phosphorus. However sulfur is recognized as one of the major nutrients essential for plant growth, root nodule formation of legumes and plants protection mechanisms. Sulfur deficiency has become widespread in many countries in Europe.[28][29][30] Because atmospheric inputs of sulfur will continue to decrease, the deficit in the sulfur input/output is likely to increase, unless sulfur fertilizers are used.

In plants and animals the amino acids cysteine and methionine contain sulfur, as do all polypeptides, proteins, and enzymes which contain these amino acids. Homocysteine and taurine are other sulfur-containing acids which are similar in structure, but which are not coded for by DNA, and are not part of the primary structure of proteins. Glutathione is an important sulfur-containing tripeptide which plays a role in cells as a source of chemical reduction potential in the cell, through its sulfhydryl (-SH) moiety. Many important cellular enzymes use prosthetic groups ending with -SH moieties to handle reactions involving acyl-containing biochemicals: two common examples from basic metabolism are coenzyme A and alpha-lipoic acid.

Disulfide bonds (S-S bonds) formed between cysteine residues in peptide chains are very important in protein assembly and structure. These strong covalent bonds between peptide chains give proteins a great deal of extra toughness and resiliency. For example, the high strength of feathers and hair is in part due to their high content of S-S bonds and their high content of cysteine and sulfur (eggs are high in sulfur because large amounts of the element are necessary for feather formation). The high disulfide content of hair and feathers contributes to their indigestibility, and also their odor when burned.

Traditional medical role for elemental sulfur

In traditional medical skin treatment which predates modern era of scientific medicine, elemental sulfur has been used mainly as part of creams to alleviate various conditions such as psoriasis, eczema and acne. The mechanism of action is not known, although elemental sulfur does oxidize slowly to sulfurous acid, which in turn (through the action of sulfite) acts as a mild reducing and antibacterial agent.

Precautions

This section requires expansion.

Elemental sulfur is non-toxic, but it can burn as an oxidizer or a reducing agent, producing combustion products that are toxic, such as carbon disulfide, carbon oxysulfide, hydrogen sulfide, and sulfur dioxide.

Although sulfur dioxide is sufficiently safe to be used as a food additive in small amounts, at high concentrations it reacts with moisture to form sulfurous acid which in sufficient quantities may harm the lungs, eyes or other tissues. In organisms without lungs such as insects or plants, it otherwise prevents respiration.

Hydrogen sulfide is toxic. Although very pungent at first, it quickly deadens the sense of smell, so potential victims may be unaware of its presence until death or other symptoms occur.

Sulfur trioxide, a volatile liquid at standard temperature and pressure, is extremely dangerous, especially in contact with water, which reacts with it to form sulfuric acid with the generation of much heat. Sulfuric acid poses extreme hazards to many objects and substances.

http://www.chemtutor.com/elem.htm

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http://www.scholle.com/acid/index.asp

http://www.schollechemical.com/

order 55 gal for $105

Burning sulfur-containing fuels leads to contamination of the atmosphere by large amounts of the sulfur oxides, SO_2 and SO_3. Sulfur trioxide is particularly harmful because of its reaction with water to form sulfuric acid:

SO_3 (liq) + H_2O (liq) $\rightleftharpoons$ H_2SO_4 (aq)

http://www.columbia.edu/itc/chemistry/chem-c140498/problems/chembytes/bytes_ch08.html

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Sulfuric acid from volcanic eruptions apparently combined with water etch out the surroundings.

Burn sulfur with lots of oxygen to make sulphur trioxide and pass the resulting fumes through water or water vapor. The sulphur trioxide will dissolve in water to produce sulphuric acid. Find an area producing volcanic activity and look for water near the area. Test it for acid pH and measure it's density with a hydrometer. Boil it down to a smaller volume if you need more density.

See also
http://encyclopedia.jrank.org/STE_SUS/SULPHURIC_ACID_or_OIL_OF_VITRIO.html

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sulphur cures

Though often characterized as the absent minded, bath hating philosopher, or the child that never stops asking "Why?," Sulphur has many acute applications as well. Sulphur 'types' almost always have some kind of skin complaint, but the remedy specializes in relieving dry, scaly, itchy skin, that suppurates easily. Its feverish, sweaty colds have persistent offensive yellow mucus in nasal passages, suffocative coughs and congested ears. In the digestive field, it helps indigestion with offensive flatulence and morning diarrhea. Sulphur's sleep may be disturbed by cold or restlessness and either way, wakes up unrefreshed and suffers from afternoon fatigue. Sulphur's headaches feel very constricted, hot and full with burning, bursting pain in the forehead and at the vertex (top) and may have the typical Sulphur indigestion. Sulphur is a powerful remedy that can bring things to the surface, but make sure this shoe fits. No matter how much could be listed here, it could not cover Sulphur, but at least you can get an idea.

http://www.1-800homeopathy.com/products/details.html?productid=SULF