

Desulfuration in which organic molecules containing sulfur can be desulfurated, producing hydrogen sulfide gas (H₂S), oxidation state = -2. Note the similarity to deamination.

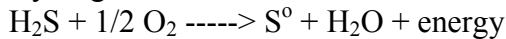
Oxidation of hydrogen sulfide produces elemental sulfur (S₀), oxidation state = 0. This reaction is done by the photosynthetic green and purple sulfur bacteria and some chemolithotrophs.

Further oxidation of elemental sulfur by sulfur oxidizers produces sulfate.

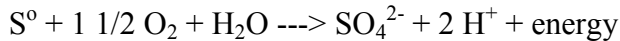
Dissimilative sulfur reduction in which elemental sulfur can be reduced to hydrogen sulfide.

Dissimilative sulfate reduction in which sulfate reducers generate hydrogen sulfide from sulfate.

Hydrogen sulfide can be oxidized to elemental sulfur:

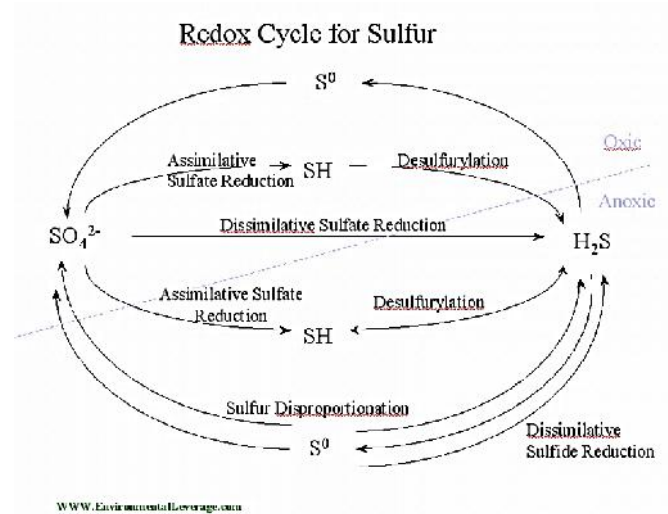


Elemental sulfur in turn can be oxidized to sulfate:



Desulfuration of decaying organic material releases hydrogen sulfide.

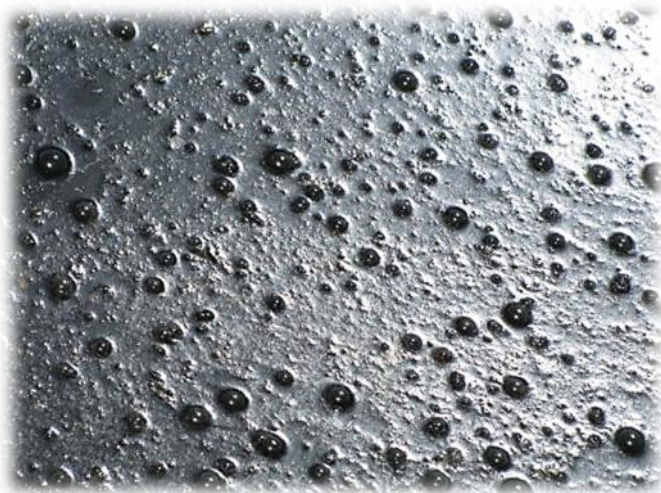
Sulfate reducers can generate hydrogen sulfide.



The control of hydrogen sulfide in wastewater collection and treatment systems is very important. The presence of hydrogen sulfide is a safety concern, in addition to being an odor and corrosion problem. Sulfide odor is objectionable in low concentrations and can be toxic at higher concentrations. It can cause serious and expensive damage to the crowns of concrete mains. If digester gas is used as a fuel, the hydrogen sulfide needs to be removed to protect the engines from corrosion and to meet SO_x emissions regulations.

H₂S Formation

The main cause of hydrogen sulfide generation is the biological decomposition of organic matter containing sulfur or from the reduction of sulfur compounds in the wastewater. The hydrogen sulfide is formed during anaerobic conditions, that is, neither oxygen nor nitrate is present. If hydrogen sulfide is present and the conditions change from anaerobic to aerobic in moist conditions, bacteria will convert free hydrogen sulfide into sulfuric acid. The sulfuric acid is the major cause of corrosion problems in the system by attacking the concrete in the sewers and pumping stations. Sulfate-reducing bacteria use sulfate instead of oxygen in their metabolism of organic matter; in the process, the bacteria change (reduce) sulfate to



sulfide, a very reactive substance. Sulfide reacts with metals to form insoluble metal sulfides such as pyrite and with organic matter to form organic sulfur compounds. Anyone who has ever visited a salt marsh may remember the "rotten egg" smell of the sulfide produced by sulfate reduction.

What is septicity?

The presence of hydrogen sulfide (H₂S) in waste water and sludge is defined as a septic condition. Septicity is a result of anaerobic bacterial activity in absence of oxygen or nitrate. By preventing septic

