

## Sources of sulfur

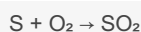
- In its elemental form underground in USA, Mexico and Poland
- Can be made from Sulfides ores
- Bi-product of from removal of sulfur from petroleum and natural gas

## Uses of sulfur

- Making of sulphuric acid (important chemical used in many industries)
- Used extensively in making rubber tyres more flexible- vulcanising (rubber tyre is heated with sulfur)

## Sulfur dioxide

- Made by the direct combination of sulfur with oxygen
- This method is the first stage of manufacture of sulphuric acid



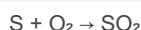
## Uses of sulfur dioxide

- As a bleach in the manufacture of wood pulp for paper
- Preservative for foods and drinks by killing bacteria
- Sulfites are added to foods and these release sulfur dioxide in acidic conditions

## Manufacture of sulphuric acid

- Synthesized by the contact process
- Uses sulfur and oxygen from air
- Is done in three distinct conditions

### Stage 1) Oxidation of sulfur



### Stage 2) Oxidation of SO<sub>2</sub> to sulfur trioxide

Catalyst used: V<sub>2</sub>O<sub>5</sub>



Conditions during stage 2

Temperature 450°C

→ Reaction is exo so increasing temperature shifts equilibrium position to the left therefore, higher the temperature, lower the yield.

Pressure 2 atm

→ Increase in pressure shifts equilibrium position to the right (direction of a smaller number of gaseous moles)

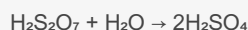
### Stage 3) Sulfur trioxide is absorbed into solution of sulfuric acid to produce oleum



## Manufacture of sulphuric acid (cont)

→ Trioxide isn't absorbed into water because a fine mist of sulfuric acid will be produced and this would be difficult to produce and thus, highly dangerous

→ Oleum is added to water to form concentrated sulfuric acid



## Properties of sulfuric acid

- It is a strong dibasic acid (two of its hydrogen atoms can be replaced by a metal)
- Reacts in a similar way to other acids with metal carbonates, oxides, hydroxides and metals (and ammonia)
- Concentrated sulfuric acid is corrosive and a powerful oxidizing agent
- A very powerful dehydrating agent (very good at removing water from other substances)

## Uses of sulfuric acid

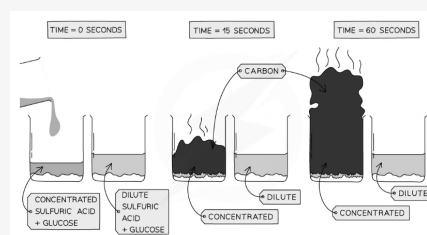
### Dilute

- Used as a catalyst in many organic reactions
- To clean the surface of metals

### Concentrated

- Used in car batteries, making phosphate fertilizers, soaps and detergents
- Used to make acid drain cleaners
- Used in production of paints and dyes

## Sugar and sulfuric acid



When mixed with sugar, (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>), concentrated H<sub>2</sub>SO<sub>4</sub> will remove water molecules and leave behind carbon, producing a tower of pure carbon