

Nitrogen and Sulfur

- Nitrogen, most abundant gas 78%
- highly unreactive because
 - the molecule is non-polar
 - $N \equiv N$ bond is really strong, so a lot of energy is required.

→ Oxides of nitrogen

→ Nature's way → Lightning provides energy for N_2 and O_2 to react.

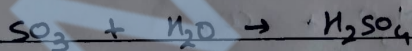
→ Manmade → N_2 and O_2 combine in hot engines of cars

→ Problems w oxides of nitrogen

→ they cause acid rain → $2NO_2 + \frac{1}{2}O_2 + H_2O \rightarrow 2HNO_3$

→ they cause photochemical smog

→ acid rain → $NO_2 + SO_2 \rightarrow NO + SO_3$



acid rain

→ Ammonia and Ammonium

→ ammonia is made from the Haber process, which uses high temp, high pressure, Iron as catalyst. $N_2 + 3H_2 \rightleftharpoons 2NH_3$

→ ammonia is a weak base, it turns damp red litmus blue.

→ ammonia + acid → ammonium

→ ammonium + base → ammonia

→ ammonium compounds are used in fertilizers.

→ NH_4NO_3 → best fertilizer

→ Nitric acid is formed from ammonia, used to make detergents and dyes.

→ ammonia + HNO_3 → NH_4NO_3

→ Nitrate fertilizers get washed away in rivers

algae grows, algae blocks sunlight from entering water

algae dies, bacteria feed on it using the dissolved O_2

aquatic life suffers due to lack of oxygen.

This is called EUTROPHICATION.

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→ Sulfur and its oxides

- sulfur is present in some fossil fuels.
- when fossil fuels are burnt, the sulfur is oxidised to sulfur dioxide gas, which causes acid rain.
- Sulfur is solid at rtp.

→ Sulfuric acid

- H_2SO_4
- used in fertilizers, detergents, and dyes.