

# CATALYTIC CONVERTERS

A T A G L A N C E

## CONSTRUCTION

- made from alloys of **platinum, rhodium and palladium**
- catalyst is mounted in a support medium to spread it out
- honeycomb construction to ensure maximum gas contact
- **finely divided** to increase surface area / get more collisions
- involves HETEROGENEOUS CATALYSIS

## HETEROGENEOUS CATALYSIS

Catalyst is in a **different phase to the reactants**  
e.g. a solid catalyst in a gaseous reaction

- Action**
- takes place at **active sites** on the **surface** of a solid
  - gases are **adsorbed onto the surface**
  - form weak bonds between gas and metal atoms

Catalysis is thought to work in **three stages** as follows ...

- Adsorption**
- formation of bonds with surface weakens bonds in gas molecules makes a subsequent reaction easier

- Reaction**
- adsorbed gases may be held on the surface increases chances of favourable collisions

- Desorption**
- the products are then released from the active sites

The **strength of adsorption is critical** ...

Too weak little adsorption - molecules will not bond to surface

Too strong molecules are held tightly and remain on the surface thus blocking reactive sites and preventing further reaction

Just right reactants are attracted yet products can leave to open up the active sites

## POLLUTANT GASES

### Carbon monoxide CO

- Origin**
- incomplete combustion of hydrocarbons in petrol because not enough oxygen was present

**Effect**

- poisonous
- combines with haemoglobin in blood
- prevents oxygen being carried

### Oxides of nitrogen NO<sub>x</sub> - NO, N<sub>2</sub>O and NO<sub>2</sub>

- Origin**
- combination of atmospheric nitrogen and oxygen under high temperature conditions in engine

**Effect**

- aids formation of photochemical smog which is irritating to eyes, nose and throat

- aids formation of low level ozone which affects plant growth and is irritating to eyes, nose and throat

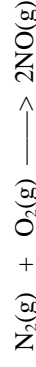


### Hydrocarbons C<sub>x</sub>H<sub>y</sub>

- Origin**
- hydrocarbons that have not undergone combustion
- Effect**
- toxic and carcinogenic (cause cancer)

## EQUATIONS FOR POLLUTION FORMATION

Nitrogen combines with oxygen



Nitrogen monoxide is oxidised

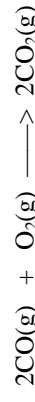


Incomplete hydrocarbon combustion



## EQUATIONS FOR POLLUTION REMOVAL

Oxidation of carbon monoxide



Removal of NO and CO



Aiding complete H/C combustion

