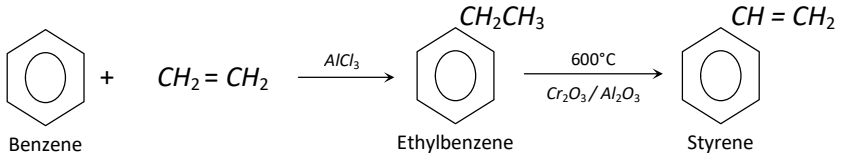
Styrene ($C_6H_5CH=CH_2$).

It is present in storax balsam and in coal-tar traces.

(1) **Preparation**

(i) **Dehydrogenation of side chain of ethylbenzene:**Dehydrogenation of side chain is affected by heating ethylbenzene to high temperature in presence of a catalyst.



(ii) **Decarboxylation of cinnamicacid:**This is the laboratory preparation. It involves heating of cinnamic acid with a small amount of quinol.

$$C_6H_5CH=CHCOOH \xrightarrow{\text{Quinol}} C_6H_5CH=CH_2 + CO_2$$

(iii) **Dehydration of 1-phenyl ethanol with H_2SO_4 :** $C_6H_5CHOHCH_3 \xrightarrow[-H_2O]{H_2SO_4} C_6H_5CH=CH_2$

(iv) **Dehydration of 2-phenyl ethanol with $ZnCl_2$:**

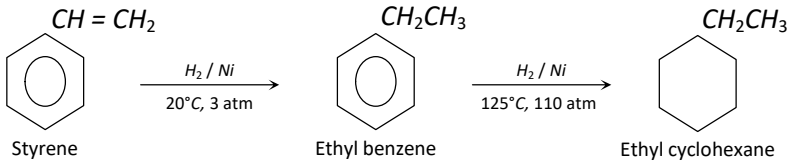
$$C_6H_5CH_2CH_2OH \xrightarrow[-H_2O]{ZnCl_2,\text{heat}} C_6H_5CH=CH_2$$

(v) **Dehydrohalogenation of 1-phenyl-1-chloro ethane:**On heating with alcoholic potassium hydroxide, a molecule of hydrogen chloride is eliminated by the chloroderivative.

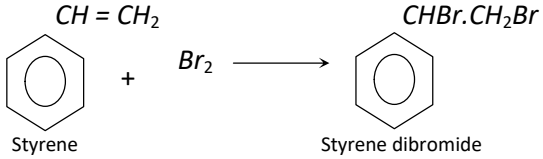
$$C_6H_5CHClCH_3 \xrightarrow[\text{Heat}]{\text{Alc.}KOH} C_6H_5CH=CH_2$$

(2)**Properties:**It is a colorless liquid, boiling point 145°C.On keeping, it gradually changes into a solid polymer called metastyrene. The polymerization is rapid in sunlight or when treated with sodium. It shows properties of benzene ring (Electrophilic substitution) and unsaturated side chain (Electrophilic addition). However, the side chain double bond is more susceptible to electrophilic attack as compared to benzene ring.

At lower temperature and pressure, it reacts with hydrogen to produce ethylbenzene and at higher temperature and pressure, it is converted into ethyl cyclohexane.

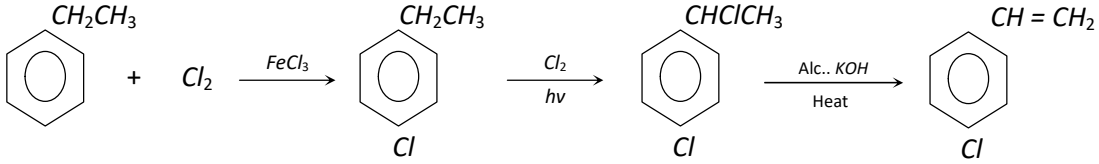


With bromine, it gives the dibromide.

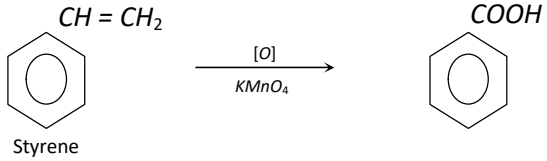


Halogen acids add to the side chain. $C_6H_5CH=CH_2 + HX \longrightarrow C_6H_5CHXCH_3$

Preparation of ring substituted styrenes is not done by direct halogenation but through indirect route.



When oxidised under drastic conditions, the side chain is completely oxidised to a carboxyl group.



In presence of peroxides, styrene undergoes free radical polymerisation resulting in the formation of polystyrene – an industrially important plastic.

$$nC_6H_5CH=CH_2 \xrightarrow{\text{Peroxide}} \left[-CH(C_6H_5)-CH_2- \right]_n$$

Co-polymers of styrene with butadiene and other substances are also important since many of them are industrially useful products such as SBR (A rubber substitute).