Preparation Reactions of Alkanes

Reduction reactions

Alkyne hydrogenation
Alkyl halide hydride reduction
Alkyl halide zinc/acid reduction
Grignard formation/destruction

Coupling reactions

Wurtz reaction

Corey-House coupling

Preparation of Alkanes via Reduction

Hydrogenation of Alkenes Hydrogenation of Alkynes

Preparation of Alkanes via Reduction

Alkyl halide reduction via lithium aluminum hydride Alkyl halide reduction via zinc / acid

$$R \xrightarrow{\downarrow} R \xrightarrow{\downarrow}$$

Formation / Destruction of Grignard reagents

$$R - C - X \qquad \frac{Mg}{\text{ether}} \qquad R - C - Mg - X$$

an alkyl halide

a Grignard reagent

$$R-C-Mg-X$$
 $R-C-H$ + $Mg(OH)X$ alkane

COUPLING REACTIONS

Wurtz reaction

$$2R-C-X \xrightarrow{Na} R-C-C-R + 2NaX$$

$$a symmetrical$$

$$alkane$$

Coupling Reactions

Corey-House coupling (Gilman reagent)

$$R-X \xrightarrow{\text{Li}} R-\text{Li} + \text{LiX}$$

$$2 R-\text{Li} \xrightarrow{\text{CuX}} R \xrightarrow{\text{Cu}-\text{Li}} + \text{LiX}$$

$$\text{an organocuprate}$$

$$(Gilman reagent)$$

$$R \xrightarrow{\text{Cu}-\text{Li}} + R'-X \xrightarrow{\text{R}} R-R' + R-\text{Cu} + \text{LiX}$$

Halogenation of Alkanes

Selectivity / Reactivity

Case II:
$$CH_3CH_2CH_3$$
 $u.v.$ $25^{\circ}C$ 75% 25%

Case III: $CH_3CH_2CH_3$ Cl_2 $u.v.$ $25^{\circ}C$ $CICH_2CH_2CH_3 + CH_3CH(Cl)CH_3$ $25^{\circ}C$ 45% 55%

Case III: $CH_3CH_2CH_3$ $u.v.$ $25^{\circ}C$ Br_2 $u.v.$ $25^{\circ}C$ $BrCH_2CH_2CH_3 + CH_3CH(Br)CH_3$ $25^{\circ}C$ 3% 97%