

# Organic Chemistry

## Using Addition Reactions to Make Various Functional Groups

Functional Group	Addition Reaction	Example
Alcohol	Acid-catalyzed hydration of an alkene	$\text{H}_2\text{C}=\text{C}(\text{CH}_3)_2 \xrightarrow[\text{H}_2\text{O}]{\text{H}_3\text{O}^+} \text{H}_2\text{C}(\text{OH})\text{C}(\text{CH}_3)_3$
	Oxymercuration-demercuration	$\text{C}=\text{C} \xrightarrow[\text{H}_2\text{O}]{\text{Hg}(\text{OAc})_2} \text{C}(\text{OH})\text{C}(\text{H}) \xrightarrow{\text{NaBH}_4} \text{C}(\text{OH})\text{C}(\text{H})$
	Hydroboration-oxidation	$\text{Cyclohexene} \xrightarrow[\text{OH}^-]{(1) \text{B}_2\text{H}_6, (2) \text{H}_2\text{O}_2} \text{Cyclohexanol}$
Aldehyde	Ozonation-reduction (ozonolysis) of an alkene	$\text{2-methyl-2-butene} \xrightarrow[\text{(2) Zn, HOAc}]{(1) \text{O}_3} \text{CH}_3\text{CHO} + \text{CH}_3\text{COCH}_2\text{CH}_3$
Alkane	Catalytic reduction of an alkene	$\text{R}_2\text{C}=\text{CR}_2 \xrightarrow[\text{Pd}]{\text{H}_2} \text{R}_2\text{CH}-\text{CHR}_2$
	Catalytic reduction of an alkyne	$\text{R}-\text{C}\equiv\text{C}-\text{R} \xrightarrow[\text{Pd}]{\text{H}_2} \text{R}-\text{CH}_2-\text{CH}_2-\text{R}$
Alkene	Partial hydrogenation of an alkyne ( <i>cis</i> )	$\text{R}-\text{C}\equiv\text{C}-\text{R} \xrightarrow[\text{Pyridine}]{\text{H}_2, \text{Pd}} \text{cis-RCH=CHR}$
	Dissolving-metal reduction of an alkyne ( <i>trans</i> )	$\text{R}-\text{C}\equiv\text{C}-\text{R} \xrightarrow[\text{Ether}]{2 \text{Na}} \xrightarrow{\text{CH}_3\text{OH}} \text{trans-RCH=CHR}$
Alkyl halide	Electrophilic hydrohalogenation	$\text{2-methyl-2-butene} \xrightarrow{\text{HCl}} \text{2-chloro-2-methylbutane}$
	Peroxide-initiated radical hydrobromination	$\text{Cyclohexene} \xrightarrow[\text{Et}_2\text{O, peroxides}]{\text{HBr}} \text{Bromocyclohexane}$
Carboxylic acid	Hot $\text{KMnO}_4$ oxidation of alkenes	$\text{2-pentene} \xrightarrow[\text{H}_2\text{O}]{\text{KMnO}_4} \text{pentanoic acid}$
Cyclohexene	Diels-Alder reaction	$\text{Cyclohexene} + \text{Methyl acrylate} \rightarrow \text{Substituted cyclohexene}$