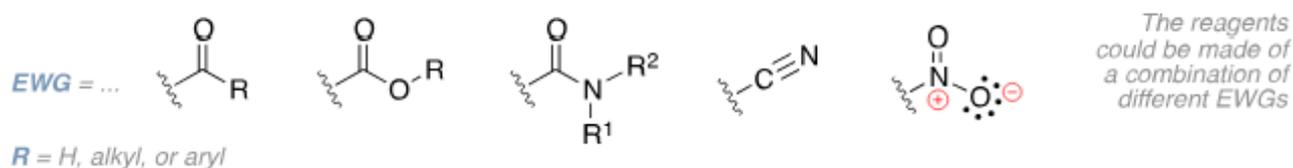
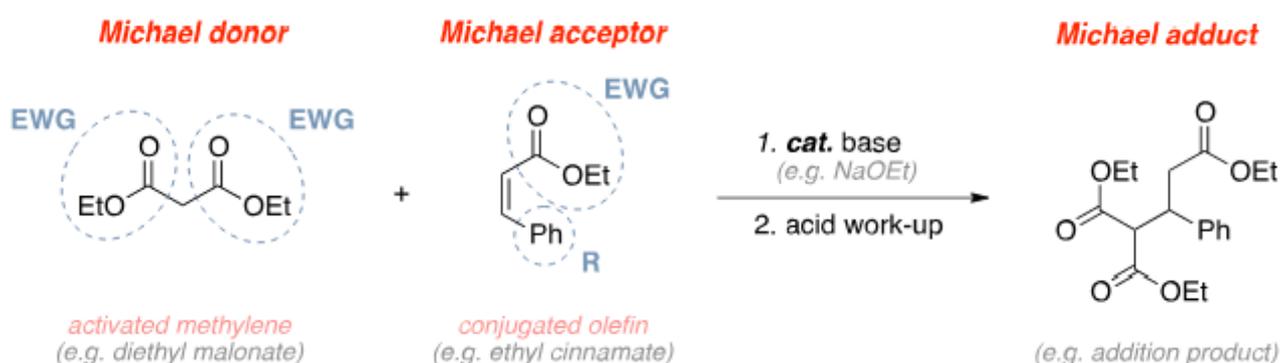


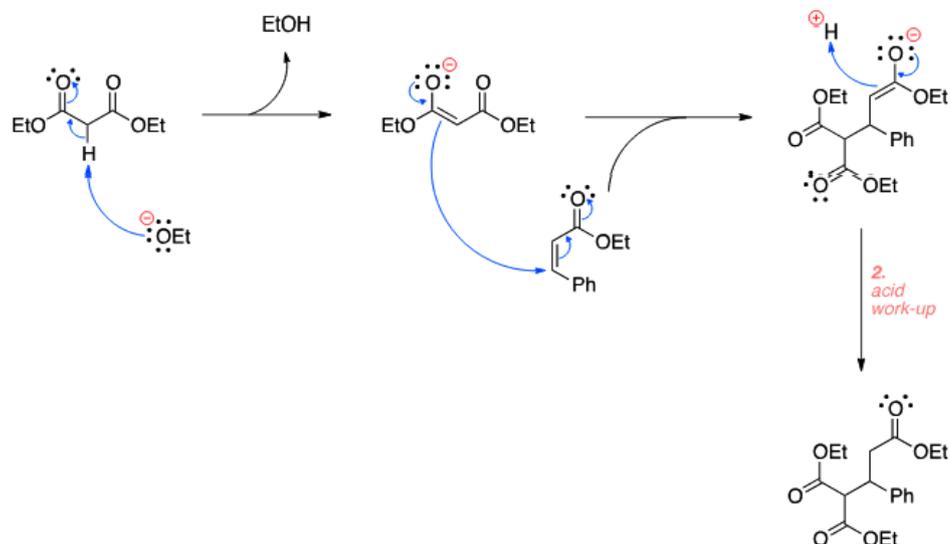
Semester – II CC -VIII Organic Chemistry
Unit – 1 Addition to Carbon-Carbon Multiple Bonds
Michael Reaction and Free Radical Addition Reaction

MICHAEL REACTION

The Michael reaction or Michael addition is the nucleophilic addition of a carbanion or another nucleophile to an α,β -unsaturated



MECHANISM



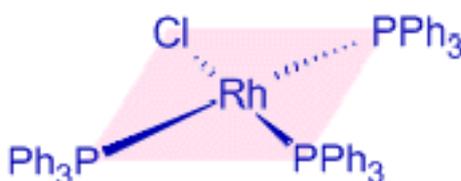
WILKINSON'S CATALYST

Homogeneous Catalysis

A homogeneous catalyst is a catalyst which is in the same phase as the substrate. Homogeneous hydrogenation involves two phases; hydrogen is in the gas phase and the catalyst and substrate (an olefin) are in the liquid phase. Therefore, although the system is technically heterogeneous, the catalyst is a homogeneous catalyst.



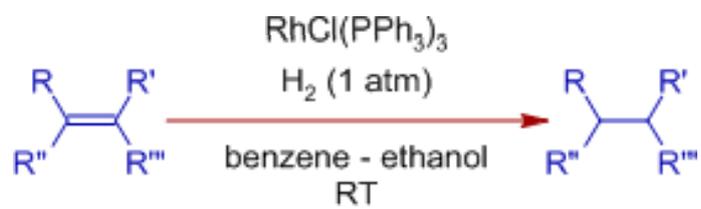
Chlorotris(triphenylphosphine)rhodium(I), is known as Wilkinson's catalyst. It is used as a homogeneous hydrogenation catalyst. It is a square planar 16-electron complex. The oxidation state of Rhodium in it is +1



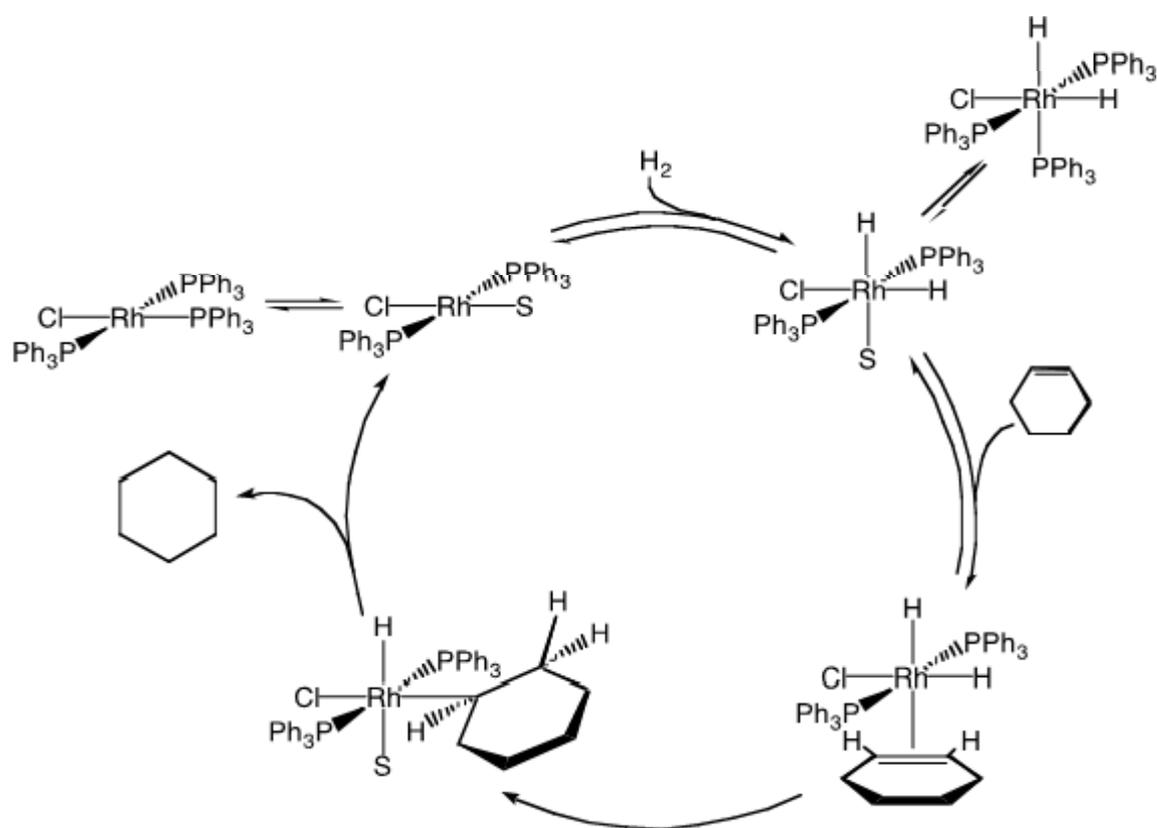
Wilkinson's catalyst can be prepared by reacting $\text{RhCl}_3 \cdot 3\text{H}_2\text{O}$ with excess PPh_3 in EtOH



It is used in the selective hydrogenation of alkenes and alkynes without affecting the functional groups like: C=O , CN , NO_2 , Aryl, CO_2R etc

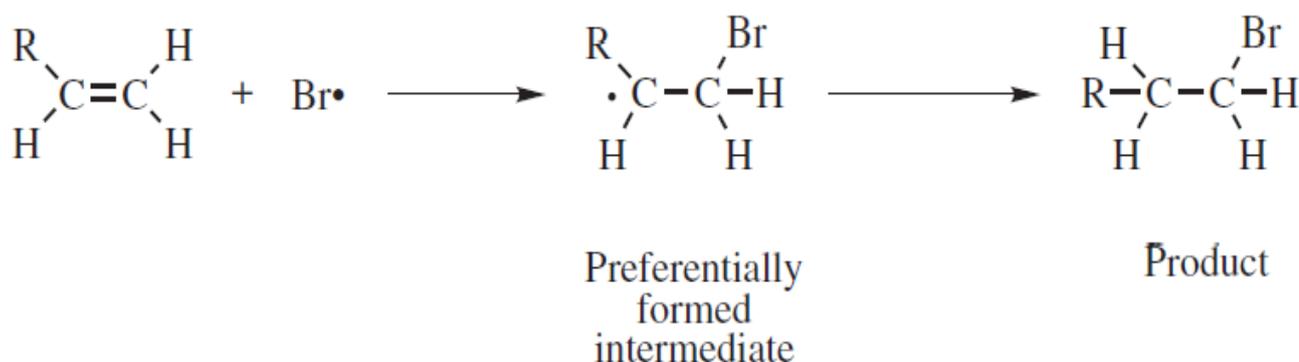


MECHANISM



FREE RADICAL ADDITION REACTION

In free-radical addition the main effect seems to be steric. All substrates $\text{CH}_2=\text{CHX}$ preferentially react at the CH_2 , regardless of the identity of X or of the radical. With a reagent such as HBr , this means that the addition is anti-Markovnikov



Thus the observed orientation in both kinds of HBr addition (Markovnikov electrophilic and anti-Markovnikov free radical) is caused by formation of the secondary intermediate. In the electrophilic case it forms because it is more stable than the primary; in the free-radical case because it is sterically preferred

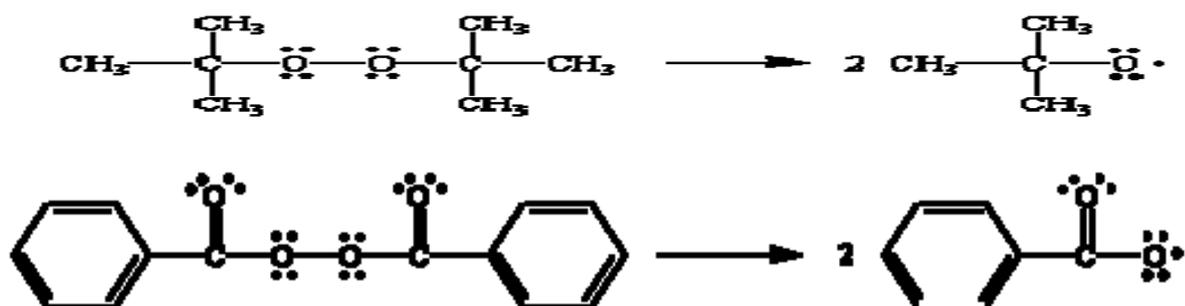
FREE-RADICAL POLYMERIZATION REACTIONS

Formation of addition polymers from monomers containing C=C double bonds; many of these compounds polymerize spontaneously unless polymerization is actively inhibited.

The simplest way to catalyze the polymerization reaction that leads to an addition polymer is to add a source of a free radical to the monomer. In the presence of a free radical, addition polymers form by a chain-reaction mechanism that contains chain-initiation, chain-propagation, and chain-termination steps.

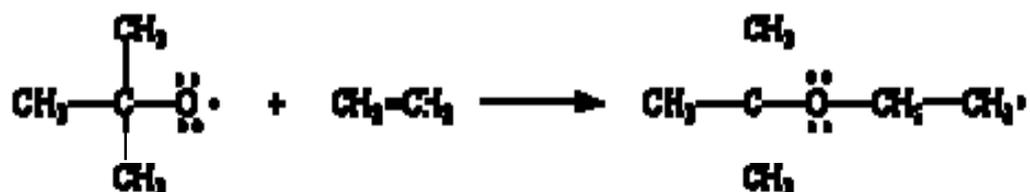
Chain Initiation

A source of free radicals is needed to initiate the chain reaction. These free radicals are usually produced by decomposing a peroxide such as di-tert-butyl peroxide or benzoyl peroxide, shown below. In the presence of either heat or light, these peroxides decompose to form a pair of free radicals that contain an unpaired electron.

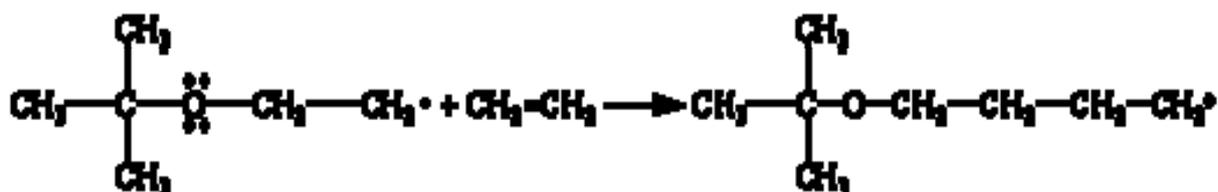


CHAIN PROPAGATION

The free radical produced in the chain-initiation step adds to an alkene to form a new free radical



The product of this reaction can then add additional monomers in a chain reaction.



CHAIN TERMINATION

Whenever pairs of radicals combine to form a covalent bond, the chain reactions carried by these radicals are terminated.

