11/05

Addition to Carbon-Carbon Multiple bond

There are four types of reactions in organic chemistry (1) Addition reaction (2) Substitution reactions (3) Elimination reactions (4) Rearrangement reaction.

The addition reactions is addition to carbon-carbon multiple bonds. Basically addition to double bond a triple bond can take place in four different ways (a) Two step processes with initial attack by a nucleophile, (b) Two step processes with initial attack upon electrophile. Two step processes with initial attack upon a free radicals.

The second step of reaction will consist of combination and thus formed intermediate with a positive species, a negative species or a neutral entity e respectively. (4) one step process which involved attack of the two. Which type of mechanism involved in the given reaction depends upon the nature of substrate, the reagent and the reaction conditions. Some reactions may takes place by all the four ways

electrophilic addition mechanism —

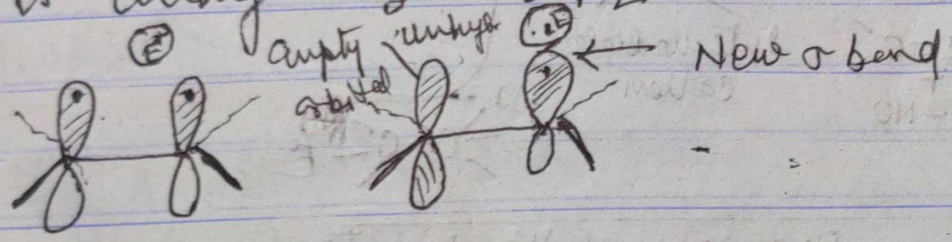
In electrophilic addition reactions π bonded electrons acts as a base and nucleophile. π bond of alkene are not free they are already involved in a bond.

The two carbon atoms of alkene gr are both sp^2 hybridized. The sp^2 hybrid orbital extending out in the same plane and a single unhybridized p-orbital ⊥ perpendicular to the plane. One lobe above the plane and the other is ~~pto~~ below the plane

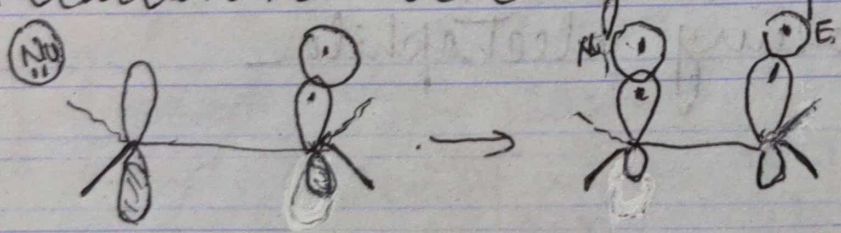
loose e⁻ density in π bond

The unhybridized p-orbital on the two alkene carbon overlap in a side by side fam a π bond. The two e⁻ shared in a π bond further away from the c-nuclei than the σ bonded electron, and thus are held less tightly. Hence less energy required to pull the π-bonded electrons out of their ~~region~~ orbital i.e. more reactive electrophile approach to ~~attack~~ ~~the~~ alkene, the electrophile it is electron poor may be able to pull

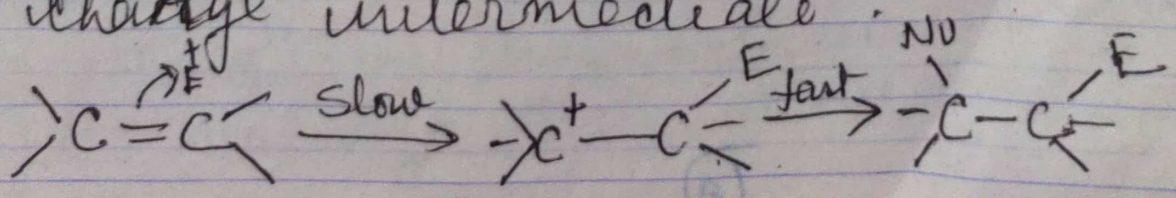
the π bonded alkene electron out of their bond into one of its empty orbital.
It happens when σ bond is formed between one of the carbon atoms and electrophile which has sp^2-sp^3. The other alkene carbon which lost π electron is still sp^2 hybridized but now bear a +ve charge because it is unhybridized $2p_z$ orbital is empty



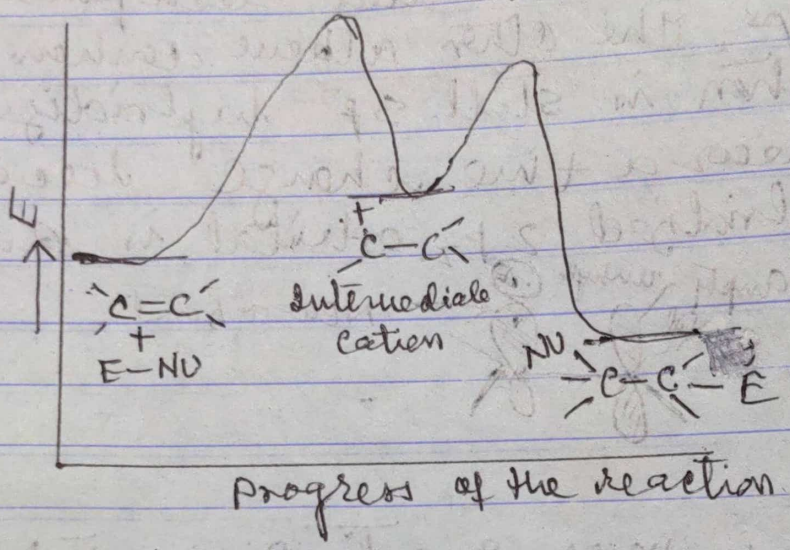
Carbocation is very reactive unstable intermediate, in electrophilic addition nucleophile quickly donate a pair of electron to form a new bond, and with the formation of σ bond carbon will change to sp3 hybrid



The first step electrophilic addition, π electron of the alkene break away to attack an electrophile is slower than the second step in which nucleophile attacks the +ve charge intermediate.



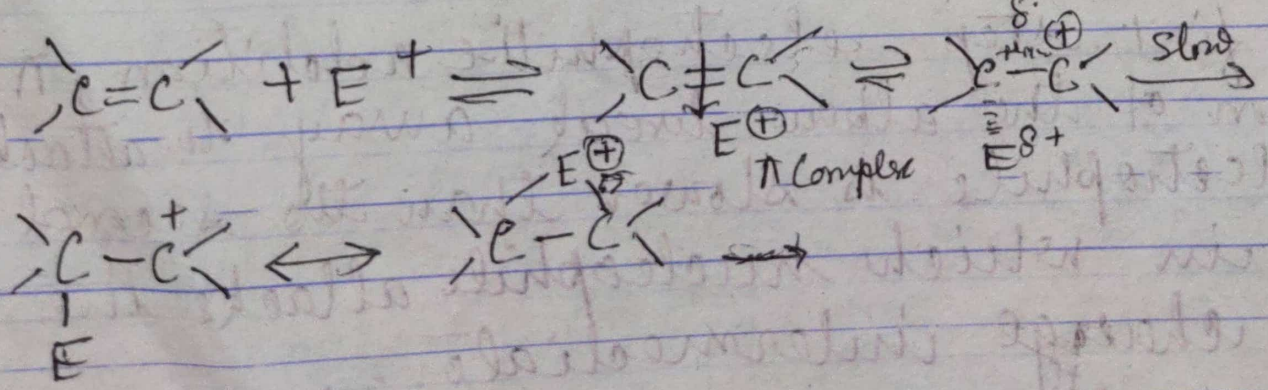
The first step electrophilic addition is the rate determining step.



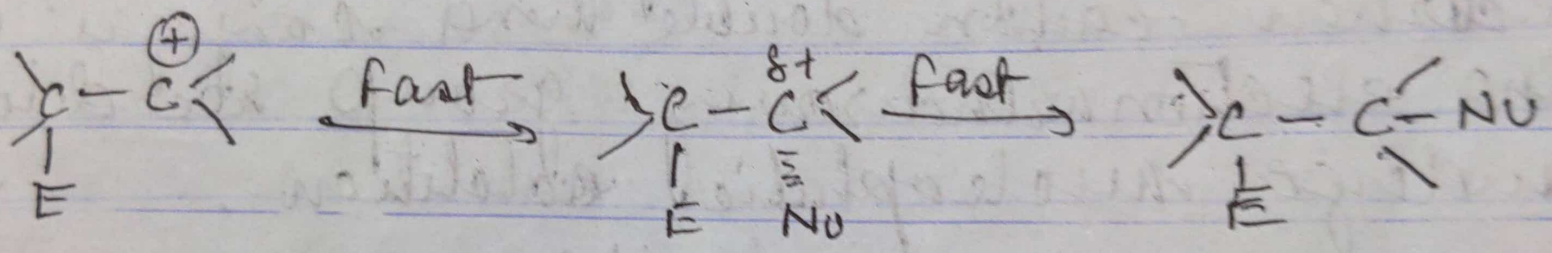
~~The first step involve breaking the existing bond and~~

Mechanism of the addition reaction involving electrophile –

1st step



Second step →



The free energy diagrame has shown above