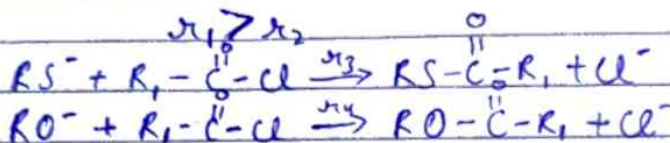
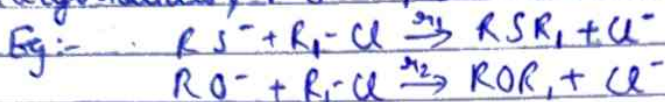


Organic Chem

* Hard and Soft Acid and Bases Reactivity

In alkyl halides, RS^- (Sulphur centre Nu⁻) $>$ RO^- (Oxygen centre Nu⁻)
In aryl halides, $RO^- > RS^-$ (Reactivity)



This was based on HSAB principle that HA binds with HB & SA with S.B. strongly

→ In Organic reactions:-

Electrophile = Acids

Nucleophiles = bases.

① HA (Hard Electrophile) are species in which reacting atom is small and \uparrow +ve \uparrow and \uparrow Polarizable.

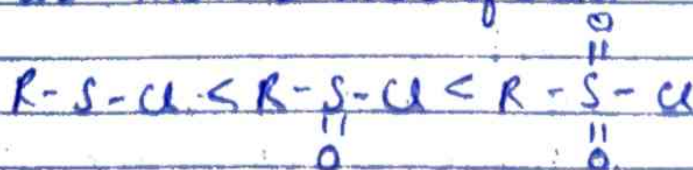
• Electrophiles where central atom belongs to lower rows of periodic table are H.E.

• where CA is in \uparrow OS are strong Electrophilic

\uparrow Hardness \downarrow in Halogens.

\downarrow Nucleophilicity \uparrow in halogens

• Electrophilicity of S atom in following species increase with increase in O.S of S atom.

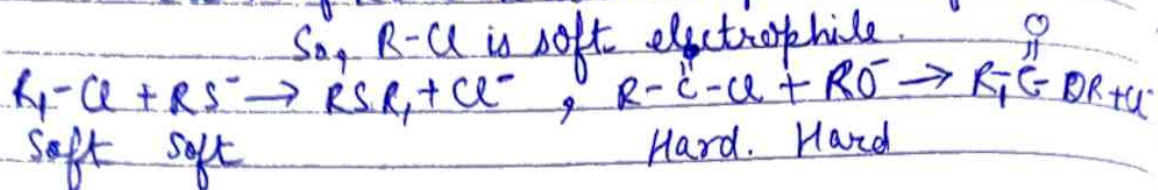


• Softness of base or nucleophile is determined by less less electro-negativity of e^- rich atom, \uparrow -ve charge on reacting atom & \uparrow polarizability of e^- cloud around reacting atom.

RS^- is soft nucleophile than RO^- (as S is less electro-negative than O)
 RS^- is soft nucleophile than RSH (charge density on S atom is greater in RS^- than RSH)

Cation of $RCOCl$ is hard nucleophile than of RCl .

So, $R-Cl$ is soft electrophile.



- ★ Super acids - Acc. to classical definition, a super acid is a acid with an acidity greater than that of 100% pure H_2SO_4 , which has Hammett acidity function of -12.
- Super acid is a medium in which the chemical potential of the proton is higher than in pure sulfuric acid.
 - More efficient proton donor than pure sulphuric acid.
 - It is viscous, corrosive liquid.
 - 10^{18} times more acidic than H_2SO_4
 - formed when S.L.A is dissolved in powerful bromated acid
 - ~~Hammett~~ Hammett acid function:- measure acidity.

$$H_a = pK_{BH^+} + \log \frac{[B]}{[BH^+]}$$

Eg:-

① Fluorosulphuric acid :- ($H_a = -15.1$)
 HSO_3F

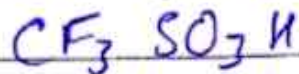
- Strongest acid commercially available
- Tetrahedral molecule, colourless liquid
- $SO_2 + H.F. \rightarrow HSO_3F$
L.A B.A

②

Carborane ($H_0 < -18$) $(X, Y, Z \in H, alk, F, Cl, Br, CF_3)$ Chemical formula: $H(XB_{10}Y_5Z)$

- At least ~~one~~ 1 million times stronger than pure H_2SO_4
- Strongest known Brønsted acid

③

Triflic acid ($H_0 = -14.9$) (Trifluoromethanesulphonic acid)

hygroscopic, colourless, slightly viscous and soluble in