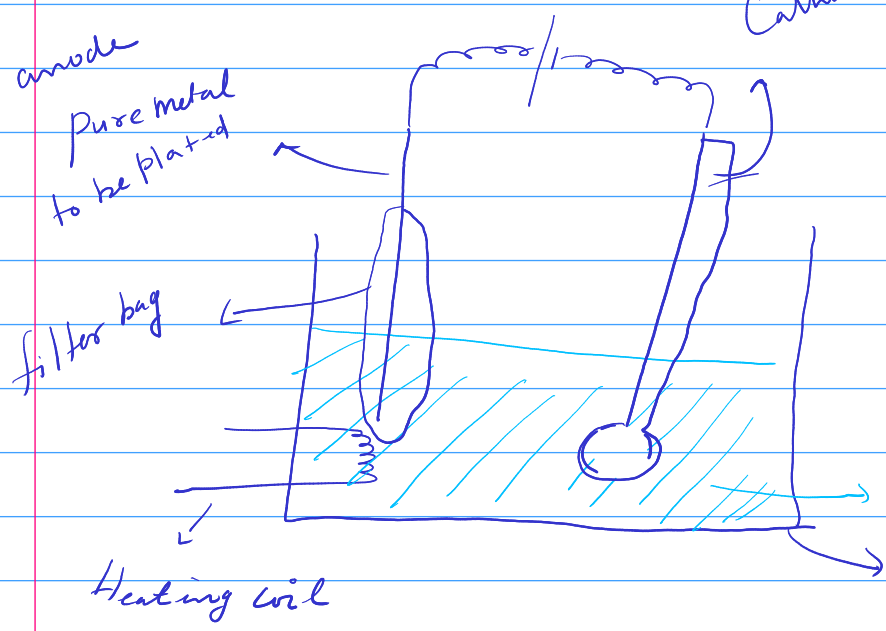
Electroplating process:-



Heating coil:-

plating is ~~done~~ @ elivated temp to Overcome Concentration polarization

→ 308 - 340 K { most Common temperature range }

Electrolyte

→ Aq. Salt of Metal to be plated

→ high Conductivity

Addatives :-

1. Supporting electrolyte:- they help in Conducting electricity in electrolyte

→ Na_2CO_3 { most Common }

$Na^+ + 1e^- \rightarrow Na \quad E^0 = -2.7V$

2. Buffer Solution:-

two Acidic Medium ⇒ H_2 generation

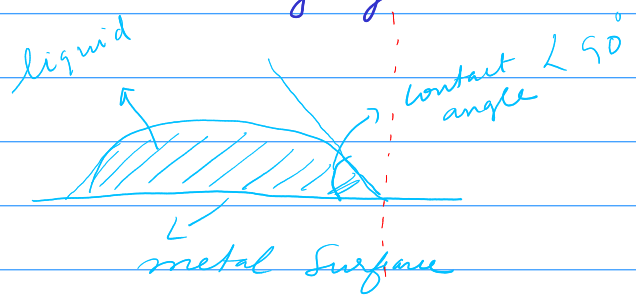
↓

H_2 get trapped @ cathode ← H_2 gas try to escape ← So plating is more brittel

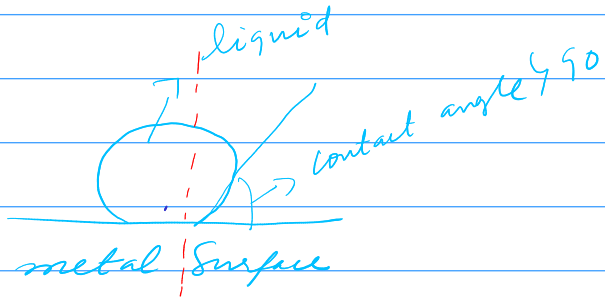
→ too basic medium → leads to formation of metal oxides/ metal hydroxides affects the Quality of plating.

→ Commonly we use p^H 4–8 for plating

3. Wetting agent:-



Surface energy & Surface tension



Surface energy & Surface tension

→ H_2 bubble
⊕ → metal ions

→ H_2 will block the metal ion from undergoing reductions

→ H_2 gas will leave the surface of electrode when they are very small → bubble will not grow larger

$C_n H_{2n+1} SO_4^- Na^+$

$n = 8 - 18$

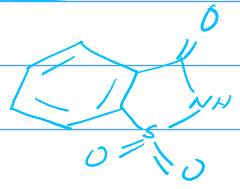
most commonly used wetting agent is Sodium lauryl Sulphate

$n = 12$, $C_{12}H_{25}SO_4^- Na^+$

Brightening agent :-

$-CN$, $-N=C=S$, $>C=O$

Stress reliver



Saccharine

Cleaning process

→ before plating object surface has to be cleaned.

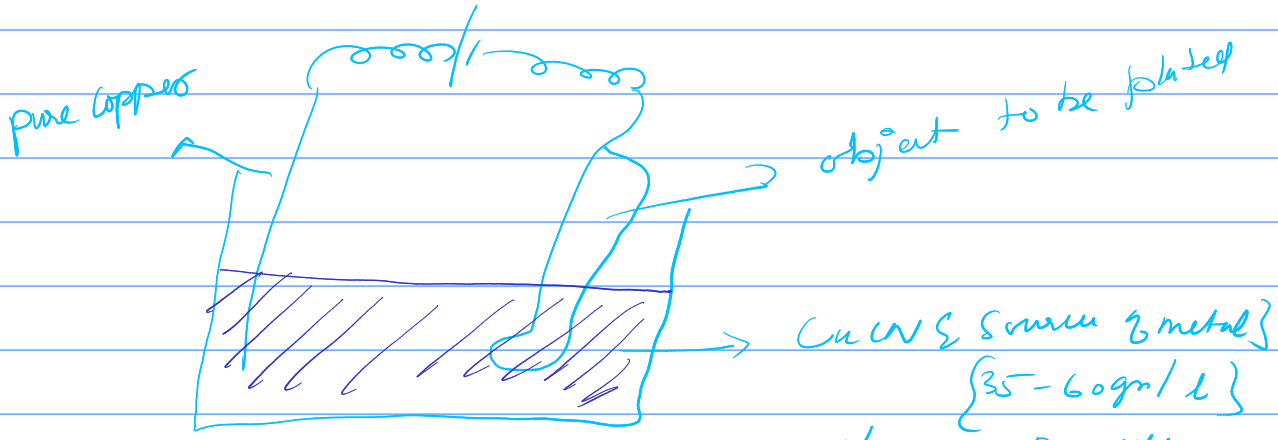
→ thermal cleaning → heat the object to high temperature

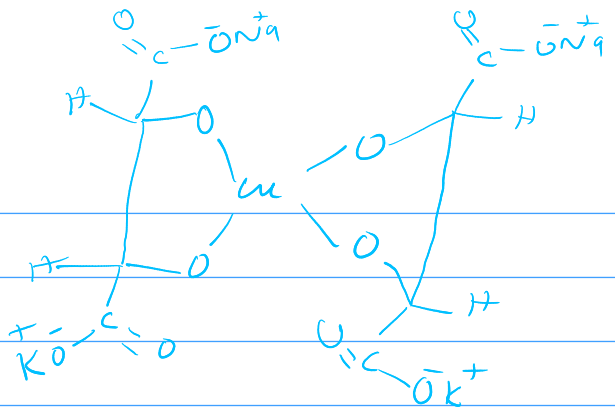
→ $C_6H_4(CH_2Cl)_2$, $Cl_2C=CHCl$

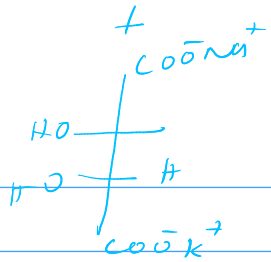
→ 10% H_2SO_4

Electroplating of Copper

- Cyanide Bath
- → Sulphate Bath.







Σ makes copper complex)

Assignment →

electroplating of copper in Sulphate Bath

→ Last date 12/1/2021

Electroless plating

→ Reduction of metal ion without electricity

→ Reduction takes place with the help of Catalysit

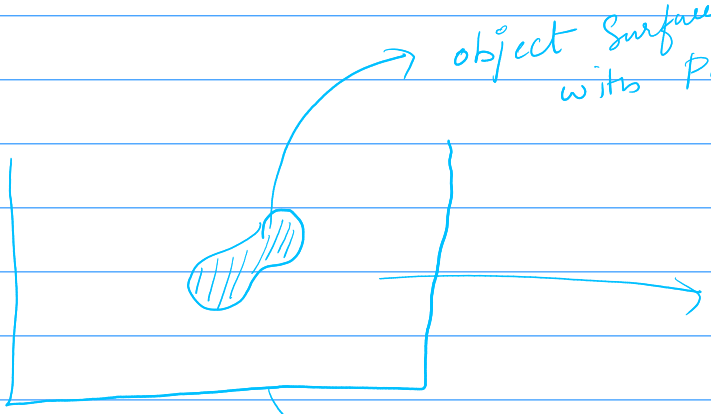
→ Substrate

↓

has Catalytically activated surface

↓

Reduction of metal ion by Chemical agent

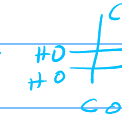


$CuSO_4$ { Source of metal for reduction }

+

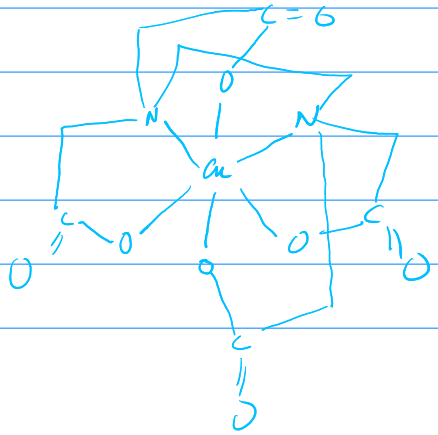
HCHO { reducing agent }

+

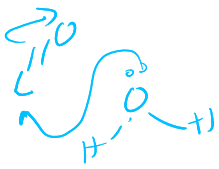
NaOH + 

+

EDTA { Complexing agent }



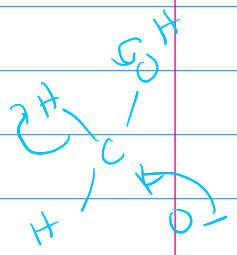
formaldehyde is going to be a reducing agent in basic medium in presence Pd Catalyst



$$HCHO + H_2O \rightarrow H_2C(OH)(OH)$$

Methylene glycol

$$H_2C(OH)(OH) + {}^-OH \rightarrow HC(OH)(O^-) + H_2O$$



$$H_2C(OH)(O^-) + {}^-OH \rightarrow HCOO^- + H_2O + \tfrac{1}{2}H_2 + 1e$$

$$HCHO + 2OH^- \xrightarrow{Pd} HCOO^- + H_2O + \tfrac{1}{2}H_2 + 1e^-$$

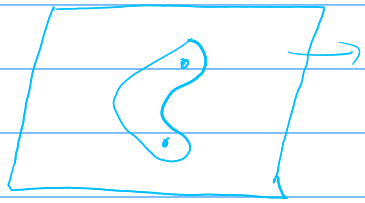
2 X

$$2HCHO + 4OH^- \xrightarrow{Pd} 2HCOO^- + 2H_2O + H_2 + 2e^-$$

$$Cu^{2+} + 2e^- \Rightarrow Cu$$

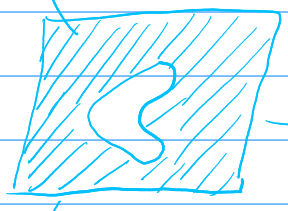
$$2HCHO + 4OH^- + Cu^{2+} \xrightarrow{Pd} 2HCOO^- + 2H_2O + H_2 + Cu$$

process of making printed Circuit Board :- (PCB)



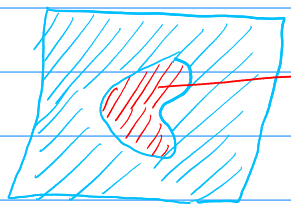
we want to make a Circuit Board of this pattern

lamination by photo resistant material

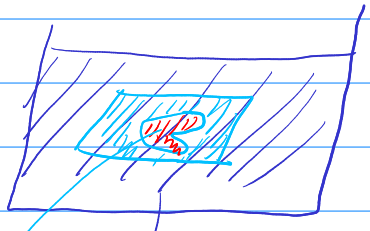


mica Board

$SnCl_2$



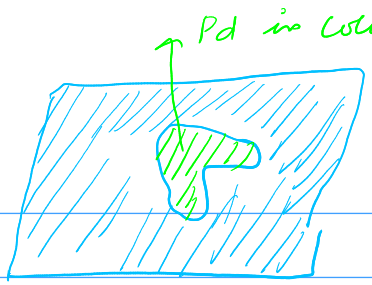
$SnCl_2$



$PdCl_2$

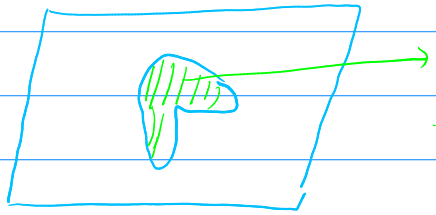
$$SnCl_2 + PdCl_2 \rightarrow SnCl_4 + Pd$$

dry it in UV light



dry Pd

dissolve the lamination in suitable solvent



Pd dry drill hole

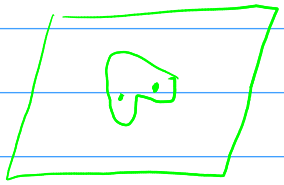
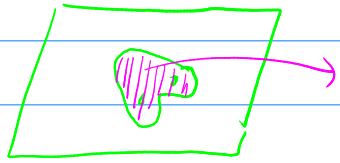


plate Cu using electroless plating method



Cu plated surface

Books:-

1. Physical Chemistry by Puri & Sharma
2. Engineering Chemistry by Jain & Jain