Steel

(1) Bessemerisation

(2) Open Hearth process

(3) L.D. process

Wrought iron $\xrightarrow[\text{alloy (Mn Si C)}]{\text{Spiegelisen}}$ Steel

JEE Mains April (8) session - 1

Ques Which of the following metal can be extracted by alkaline leaching

(1) Ag (2) Ca (3) Sn (4) Fe

due to Amphoteric nature

Extraction of lead

PbS

(1) Crushing
(2) Conc. — Froath floation
(3) Roasting

type of PbS — high grade one [rich from Pb content]
low grade one [poor from Pb content]

Roasting for High grade

Partial Roasting aircut

$PbS + O_2 \longrightarrow PbO + SO_2$

$PbS + O_2 \longrightarrow PbSO_4$

Cut off Heating Contin

$PbS + PbO \longrightarrow Pb + SO_2 \uparrow$

$PbS + PbSO_4 \longrightarrow Pb + SO_2 \uparrow$

Roasting and self reduction are done in same furnace reverberatory furnace but diff. temp.

Roasting of low grade ore :→ (with lime)

$$PbS + O_2 \longrightarrow PbO + SO_2$$

Carbon reduction [Smelting]

$$PbO + C \longrightarrow Pb + CO$$

$$PbO + CO \longrightarrow Pb + CO_2$$

(lime also added)

$$SiO_2 + PbO \longrightarrow PbSiO_3$$

$$CaO + SiO_2 \longrightarrow CaSiO_3 \text{ (Slag)}$$

if $PbSiO_3$ is formed then

$$PbSiO_3 + CaO \longrightarrow PbO + CaSiO_3$$

Note ⇒ function of lime :- (i) it prevent formation of $PbSO_4$ and $PbSiO_3$

(ii) It helps to mass pouring

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earth crust

O > Si > Al > Fe

Purification

Pb is obtained from AIR reduction (self Reduction) and Carbon reduction contain many impurities like

As Sb Sn Cu Zn Bi Ag Au

due to presence of base metals Base Metals Pb becomes hard and brittle. for removal of these impurities Blast of hot air passed in to molten Pb so As and Sb are removed due to formation of their Volatile oxide

Other metals (Sn Cu Bi Zn) form their oxides and their oxides form scum after removal of scum Pb becomes soft So this is called softning process

after softning process Pb contain impurity Ag and (Pb-Ag) is it called Argentiferrous lead or (Pb-Ag) Commerical lead.

for removal of Ag parke's pattinson process [desilverisation]

$$(Pb\text{-}Ag) + \underset{(\%.1)}{Zn} \xrightarrow{Cool} \frac{X\ layer}{Y\ layer}$$

X. layer = (Zn + Ag) alloy

y-layer = molten Pb [further purified by Bett's electrolysis]

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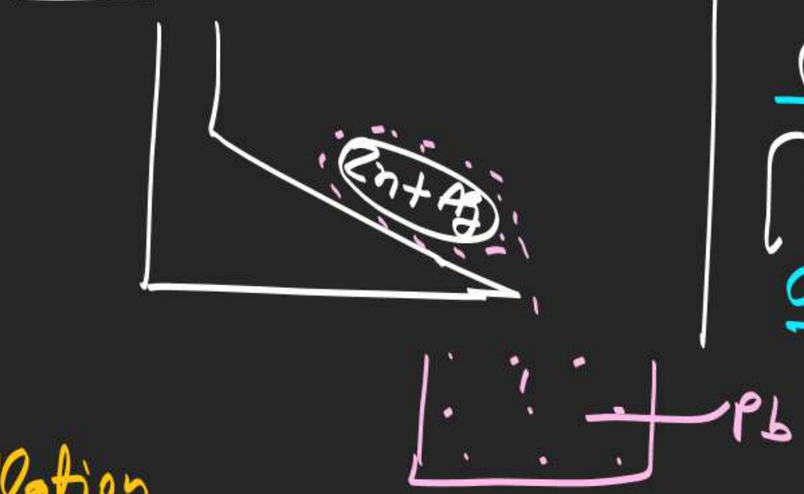
Liq.



Note

Parke's pattin process

[when % of Pb is higher]

Cupellation → (when % of Ag ↑)

Distallation

Zn+Ag $\xrightarrow{\Delta}$ Zn↑ (vap.)

Ag (Pb as impurity present)

Cupellation

(pure) Ag

PbO ↑

Bett's Electrolysis

at anode

$$Pb \longrightarrow Pb^{+2} + 2e^-$$

at Cathode

$$Pb^{+2} + 2e^- \longrightarrow Pb$$

Note ⇒ Small amount of gelatin also added so lead Obtained on cathode becomes smooth and uniform.

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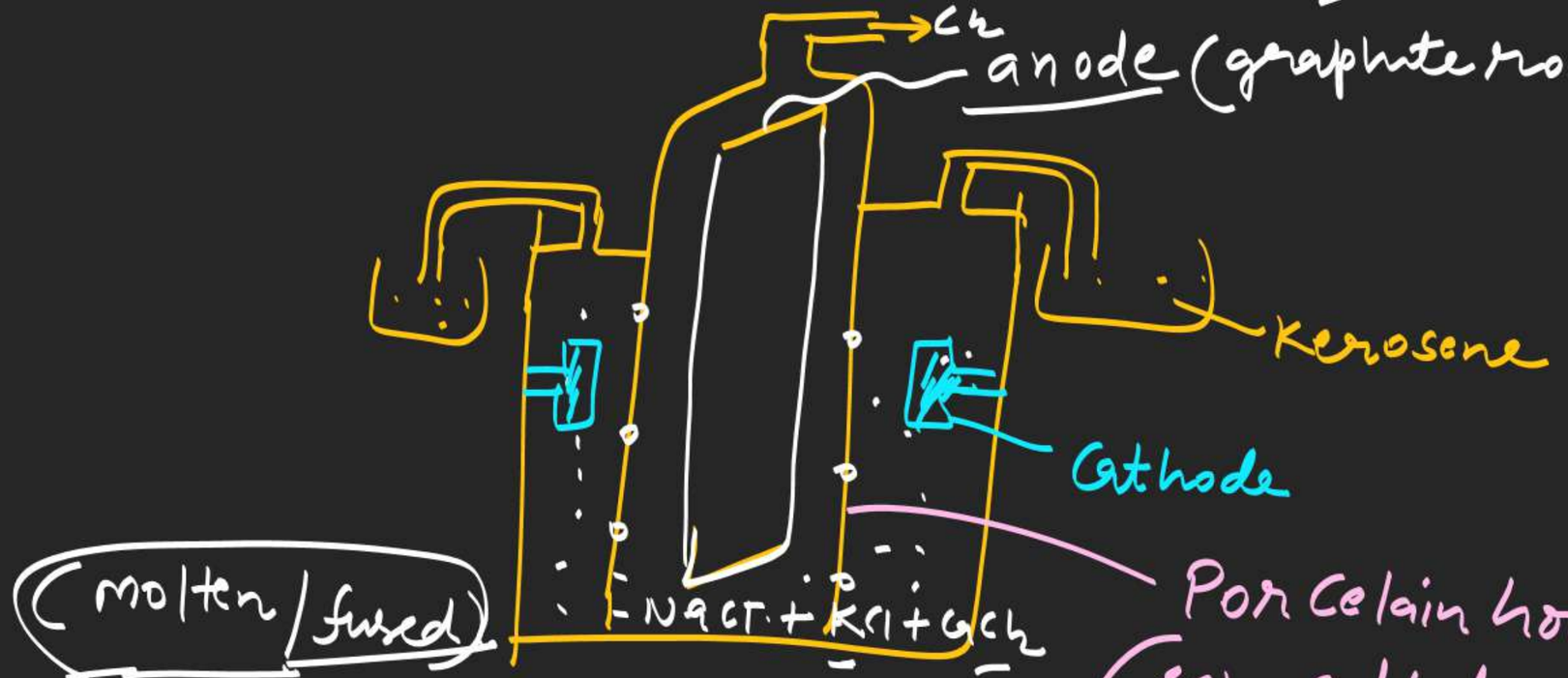
Extraction of Na (Down Cell)



$NaCl_{(l)} \longrightarrow Na^+ + Cl^{\ominus}$

at Cathode

$Na^+ + e^- \longrightarrow Na$

at anode

$Cl^- \longrightarrow \frac{1}{2}Cl_2 + e^-$

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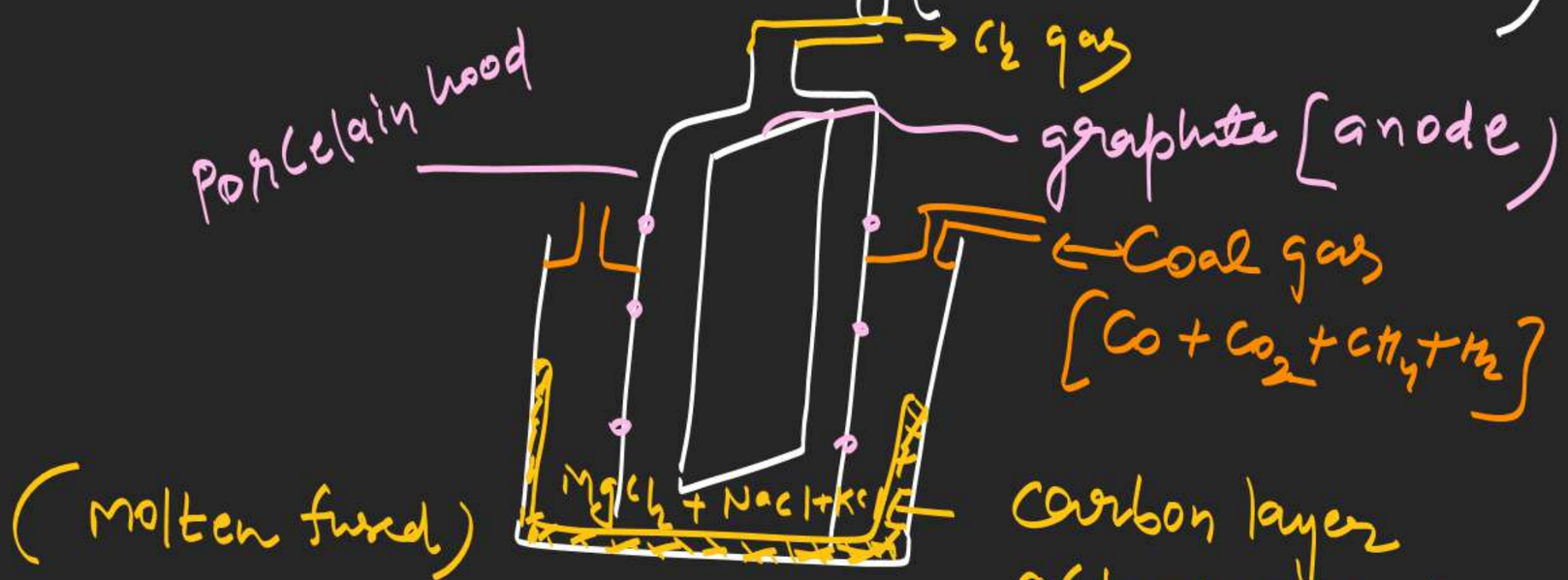
Extraction of Mg (Sea-Dow process)



$$MgCl_2 \longrightarrow Mg^{+2} + 2Cl^{\ominus}$$

at Cathode

$$Mg^{+2} + 2e^- \longrightarrow Mg$$

at anode

$$Cl^{\ominus} \longrightarrow \frac{1}{2}Cl_2 + e^-$$

Dow's Sea process

Sea water + $Ca(OH)_2$ ⟶ Sol: $CaCl_2$ + ppt: $Mg(OH)_2$

filtered

$Mg(OH)_2$ $\xrightarrow{HCl}$ $MgCl_2$.

$MgCl_2 + H_2O \xrightarrow[water]{dissolve} MgCl_2(aq.)$

$MgCl_2(aq.) \xrightarrow{Cool} MgCl_2 \cdot 6H_2O$

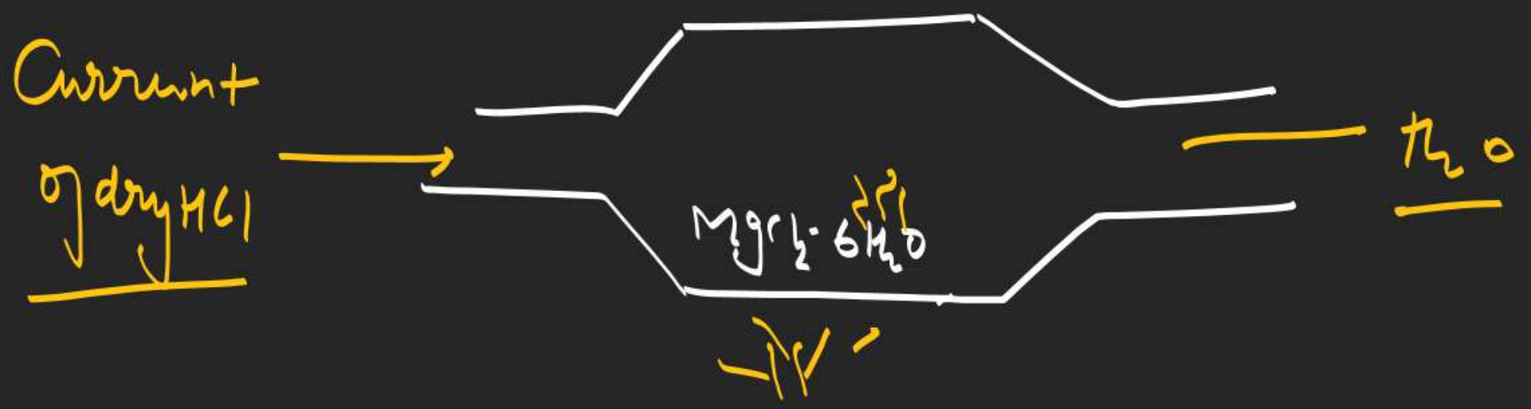
$Mg(OH)_2$

$CaCl_2$ (filtrate)

Hydrolysis

$MgCl_2 \cdot 6H_2O \xrightarrow{\Delta} MgO + HCl$

$MgCl_2 \cdot 6H_2O \xrightarrow{\text{Dry HCl}} MgCl_2 + H_2O\uparrow$



low grade Cu → Hydrometallurgy

leaching

① $Cu + H_2SO_4 \longrightarrow Cu^{+2}$
(acid)

$Cu^{+2} + 2H \longrightarrow Cu + 2H^+$
(R.A)

Imp ⇒ Reducing agent

Zn and Fe

but we will prefer Fe because Zn costlier -

eg:

$Cl^{\ominus} \longrightarrow \frac{1}{2} Cl_2 + e^{\ominus}$

$\Delta G = +ive \left(+422\ KJ/mole\right)$

$\Delta G = -nFE^{\circ}$

$E^{\circ} = -2.2$

thats way we provide

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