Phosphate bead test

$NaNH_4HPO_4 \cdot 4H_2O \xrightarrow[-4H_2O]{\Delta} NaNH_4HPO_4 \xrightarrow{\Delta} NaPO_3 + NH_3\uparrow + H_2O\uparrow$

Sodium ammonium Hydrogen phosphate

(microcosmic salt)

Sodium Meta phosphate

transparent glassy bead

example $CoSO_4 \xrightarrow{\Delta} CoO + SO_3\uparrow$

$CoO + NaPO_3 \longrightarrow NaCoPO_4$

Ortho phosphate

salt Blue

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Sodium carbonate bead test

$$Na_2CO_3 \cdot 10H_2O \xrightarrow[-10H_2O]{\Delta} Na_2CO_3$$

White bead

White bead + KNO_3 + salt $\xrightarrow{\Delta}$

$Cr_2(SO_4)_3 \xrightarrow{\Delta} Cr_2O_3 + SO_3\uparrow$

$KNO_3 \longrightarrow KNO_2 + O_2$

$Na_2CO_3 + Cr_2O_3 + O_2 \xrightarrow{\Delta} Na_2CrO_4 + CO_2\uparrow$

Yellow

- if white bead turns green (Na_2MnO_4) then Mn present
- if white bead turns yellow Na_2CrO_4 then Cr present

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$$MnSO_4 \xrightarrow{\Delta} MnO + SO_3\uparrow$$

$$MnO + O_2 + Na_2CO_3 \longrightarrow \underset{\text{green colour}}{Na_2MnO_4}$$

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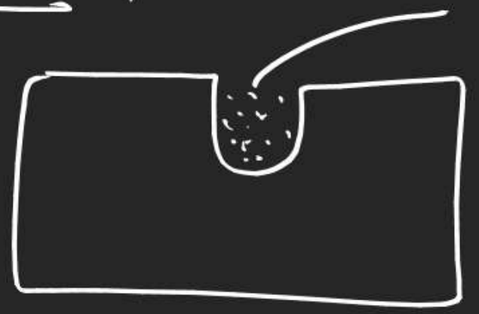
Cobalt nitrate Charcoal Cavity test

if salt Contain $ZnSO_4$



salt + Na_2CO_3 + $Co(NO_3)_2$ (few drops)

$ZnSO_4 + Na_2CO_3 \xrightarrow{\Delta} Na_2SO_4 + ZnCO_3$

$ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2\uparrow$

$Co(NO_3)_2 \xrightarrow{\Delta} CoO + NO_2\uparrow + O_2\uparrow$

$CoO + ZnO \xrightarrow{\Delta} ZnCoO_2$ or $CoO.ZnO$

Rinman's green

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Zn^{+2} $CoO \cdot ZnO$ Rinman's green

Al^{+3} $CoO \cdot Al_2O_3$ Thenard blue

Sn^{+2} $CoO \cdot SnO$ Bluish white

Mg^{+2} $CoO \cdot MgO$ Pink Residue

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Wet test

group	cation	group reagent
I	Pb^{+2} Hg_2^{+2} Ag^{+} — प्रथा होगी आगे	dil HCl
II — IIA [Cu family]	Pb^{+2} Cu^{+2} Hg^{+2} Cd^{+2} Bi^{+3} — प्रथा कुटी मेरी कैद भाई	H_2S gas in acidic medium
II — IIB [As family]	As^{+3} As^{+5} Sn^{+2} Sn^{+4} Sb^{+3} Sb^{+5}	
III	आल क्रोड़पति फकीर — Al^{+3} Cr^{+3} Fe^{+3}	NH_4OH in presence of NH_4Cl
IV (नीचे)	नी को मं जान — Ni^{+2} Co^{+2} Mn^{+2} Zn^{+2}	H_2S gas in basic medium
V (धारत)	Ba^{+2} Sr^{+2} Ca^{+2} — सर कर	$(NH_4)_2CO_3$ in presence of NH_4Cl and NH_4OH
VI	Na^{+} Mg^{+2} K^{+} — ना मांगो कर	No Comman Reagent

down the group

K_{sp} ↑

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Original solution

Salt + cold water — if soluble then original sol. prep. if not soluble then

Salt + hot water — if soluble then original sol. prep. if not soluble then

Salt + dil HCl — if soluble then original sol. prep. if not soluble then

Salt + Conc. HCl — if sol. then original sol. prep. if not soluble then

Salt + Conc. HNO_3 — if sol. then original sol. prep. if not soluble then

Salt + aqua regia — if sol. then original sol. prep. if not soluble

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Original sol^{n} + dil HCl ⟶ if white ppt then I group cation present after filtration

I group filtrate + H_2S gas ⟶ if ppt then II group present after filtration

II group filtrate + NH_4OH in presence of NH_4Cl ⟶ if ppt then III group present after filtration

III group filtrate + H_2S gas ⟶ if ppt then IV group present after filtration

IV group filtrate + $(NH_4)_2CO_3$ is added ⟶ if ppt then V group present

V group filtrate ⟶

$PbCl_2$ ⇒ Sparingly soluble in cold water but Complete soluble in hot water

that Why Pb^{+2} is the only cation which is identify in I^st group Cation as well as 2nd group cation

NH_4^+ Can never be placed in I to VI group because it is already present in the form of group reagent

Order of solubility

Ni_2S CuS ZnS

Ans $\Rightarrow$ $Ni_2S > ZnS > CuS$

Note $\Rightarrow$ before performing the test of 3rd group cation 2nd group. filtrate must be neutralize for removal of H_2S gas after this little Conc. HNO_3 is added.

$Fe^{+3} + H_2S \longrightarrow Fe^{+2} + S\downarrow$

White/yellow ppt.

$Fe^{+2} + Conc.HNO_3 \longrightarrow Fe^{+3}$

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Kipp's

$FeS + dil\ HCl / dil\ H_2SO_4 \longrightarrow FeSO_4 / FeCl_2 + H_2S$

Qui H_2S gas is added as 2nd group reagent but in presence of acidic medium why

When H_2S ionised then S^{-2} Conc. is Sufficient for 2nd group cation as well as few fourth group cation but in presence of acidic (2n) medium S^{-2} Conc ↓ due to C.I.E

$H_2S \rightleftharpoons 2H^+ + S^{-2}$

$HCl \longrightarrow H^+ + Cl^{\ominus}$

C.I.E

Q. H_2S gas is a III group reagent in basic medium why

Ans:-

$$H_2S \rightleftharpoons 2H^+ + S^{-2}$$

$$NaOH \longrightarrow Na^+ + OH^-$$

Q. NH_4OH in presence of NH_4Cl use as III group reagent why.

$$NH_4OH \rightleftharpoons NH_4^+ + OH^-$$

$$NH_4Cl \longrightarrow NH_4^+ + Cl^-$$

$\bar{O}H$ Conc. is Suffecint for 3rd group as well as

VI group Mg

only $(NH_4)_2CO_3$ is used as V group reagent in presence of NH_4Cl and NH_4OH Why

$$(NH_4)_2CO_3 \longrightarrow NH_4^+ + CO_3^{-2}$$

CO_3^{-2} Conc is sufficient for V group cation as well as VI group Mg

$$NH_4Cl \longrightarrow NH_4^+ + Cl^-$$

buffer action

$$NH_4^+ + CO_3^{-2} \longrightarrow CO_2\uparrow + NH_3\uparrow + H_2O$$