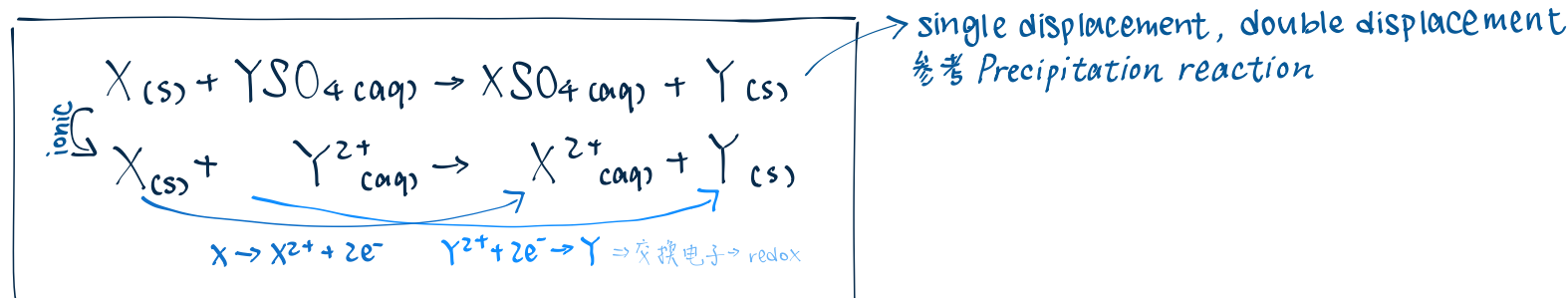


Displacement reactions

1 Principle



- 越 reactive 的金属 (X), 越容易流失电子成为离子 → strong reducing agent, weak oxidating agent
- 越 unreactive 的金属 (Y), 它的离子越易吸收电子成为金属 → weak reducing agent, strong oxidating agent
- ↳ 必须为 **强金属 + 弱金属离子** 才有 reaction
- reactivity: 参考 reactivity series
- 注意点
 - > 如果两种金属颜色相同, 则不能观察 dissolve/deposit
 - > 因为 reactant 与 product 都有 solid, 因此不可能获取 pure 的 product
→ Y is insoluble in water, **encloses** X ⇒ stops further reaction
 - > 若两个 reactant 也是 solid, 则必须加热才有 reaction (没 mobile ion)
 - > K, Na, Ca 永远也没有 displacement (还没 displace 以前已经先与 H₂O/O₂ react 了)

2 Examples

不懂罚站题

1. $Zn(s) + MgCl_2(aq)$
 - Zn is a **weaker reducing agent** than Mg
 - ⇒ X reaction
 2. $Cu(s) + AgNO_3(aq)$
 - Cu is a **stronger reducing agent** than Ag
 - ⇒ ✓ reaction
 - $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$
 $Cu + 2Ag^+ \rightarrow Cu^{2+} + 2Ag$
 - observable changes
 - a. Solution: colourless → blue
 - b. Cu dissolves
 - c. Silvery solid deposits
- 只可以写 reactant 的名字
product 要用 <colour> <state> 形容

狡猾题

1. $Zn(s) + FeSO_4(aq)$
 - Zn is a **stronger reducing agent** than Fe
 - ⇒ ✓ reaction
 - $Zn(s) + FeSO_4(aq) \rightarrow ZnSO_4(aq) + Fe(s)$
 $Zn + Fe^{2+} \rightarrow Zn^{2+} + Fe$
 - observable changes
 - a. Solution: pale green → colourless
2. $Al(s) + CuO(s)$
 - Al is a **stronger reducing agent** than Cu
 - ⇒ ✓ reaction (needs heat ∵ both are solid)
 - $2Al(s) + 3CuO(s) \xrightarrow{\text{heat}} Al_2O_3(s) + 3Cu(s)$
no ionic equ. as all reactant/product is solid
 - observable changes
 - a. Solid: black ^{CuO} → white ^{Al₂O₃}
 - b. reddish brown solid deposits
- 3a. $Na(s) + Cu(NO_3)_2(aq)$
 - 看似有, 但 K, Na, Ca 会先跟水 react (→ hydroxide)
 - ⇒ X displacement reaction
- 3b. $Ca(s) + Ag_2O(s)$
 - K, Na, Ca 会先跟空气里面的氧气 react (→ oxide)
 - ⇒ X displacement reaction