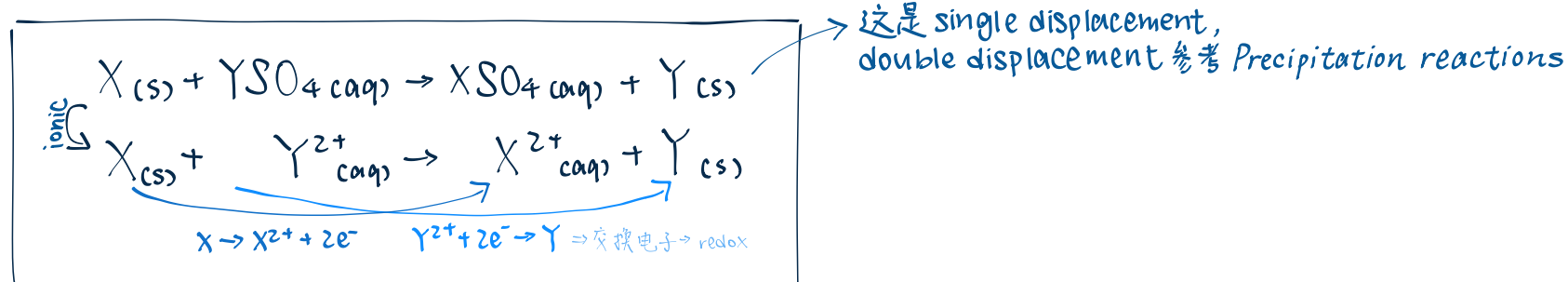


Displacement reactions

1 Principle



- 越 reactive 的金属 (X), 越容易流失电子成为离子 \rightarrow 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 \rightarrow weak reducing agent, strong oxidating agent
- \hookrightarrow 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
 - \rightarrow Y is insoluble in water, encloses X \Rightarrow 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 $\text{H}_2\text{O}/\text{O}_2$ react 了)

2 Examples

不懂罚站题

1. $\text{Zn}_{(\text{s})} + \text{MgCl}_{2(\text{aq})}$
 - Zn is a weaker reducing agent than Mg
 - \Rightarrow X reaction
2. $\text{Cu}_{(\text{s})} + \text{AgNO}_{3(\text{aq})}$
 - Cu is a stronger reducing agent than Ag
 - \Rightarrow \checkmark reaction
 - $\text{Cu}_{(\text{s})} + 2\text{AgNO}_{3(\text{aq})} \rightarrow \text{Cu}(\text{NO}_3)_{2(\text{aq})} + 2\text{Ag}_{(\text{s})}$
 $\text{Cu} + 2\text{Ag}^+ \rightarrow \text{Cu}^{2+} + 2\text{Ag}$
 - observable changes
 - a. Solution: colourless \rightarrow 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. $\text{Zn}_{(\text{s})} + \text{FeSO}_{4(\text{aq})}$
 - Zn is a stronger reducing agent than Fe
 - \Rightarrow \checkmark reaction
 - $\text{Zn}_{(\text{s})} + \text{FeSO}_{4(\text{aq})} \rightarrow \text{ZnSO}_{4(\text{aq})} + \text{Fe}_{(\text{s})}$
 $\text{Zn} + \text{Fe}^{2+} \rightarrow \text{Zn}^{2+} + \text{Fe}$
 - observable changes
 - a. Solution: pale green \rightarrow colourless
 - * no dissolve/deposit OC as both is silvery solid
2. $\text{Al}_{(\text{s})} + \text{CuO}_{(\text{s})}$
 - Al is a stronger reducing agent than Cu
 - \Rightarrow \checkmark reaction (needs heat \because both are solid)
 - $2\text{Al}_{(\text{s})} + 3\text{CuO}_{(\text{s})} \xrightarrow{\text{heat}} \text{Al}_2\text{O}_{3(\text{s})} + 3\text{Cu}_{(\text{s})}$
no ionic equ. as all reactant/product is solid
 - observable changes
 - a. Solid: black $\xrightarrow{\text{CuO}}$ white $\xrightarrow{\text{Al}_2\text{O}_3}$
 - b. reddish brown solid deposits
- 3a. $\text{Na}_{(\text{s})} + \text{Cu}(\text{NO}_3)_{2(\text{aq})}$
 - 看似有, 但 K, Na, Ca 会先跟水 react (\hookrightarrow hydroxide)
 - \Rightarrow X displacement reaction
- 3b. $\text{Ca}_{(\text{s})} + \text{Ag}_2\text{O}_{(\text{s})}$
 - K, Na, Ca 会先跟空气里面的氧气 react (\hookrightarrow oxide)
 - \Rightarrow X displacement reaction