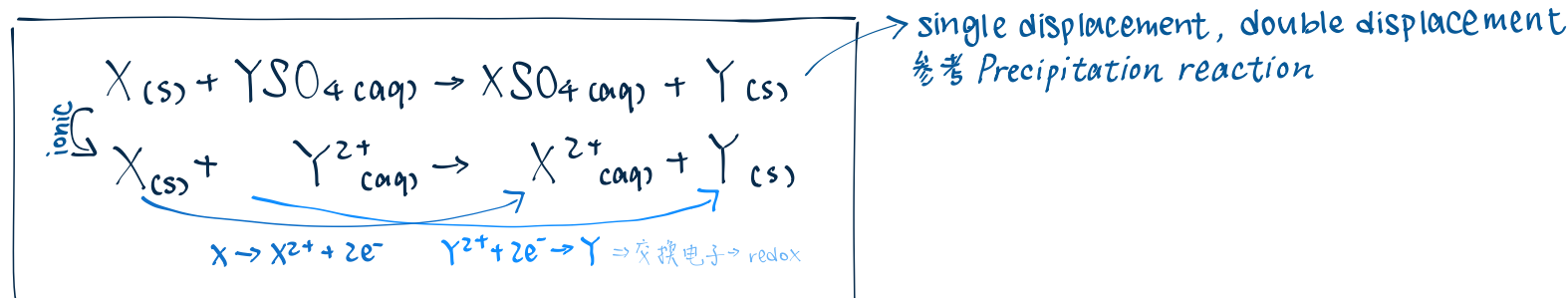


# Displacement reactions

## 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 H<sub>2</sub>O/O<sub>2</sub> 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
  - \* **no dissolve/deposit** bc as **both is silvery solid**
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 <sup>CuO</sup> → white <sup>Al<sub>2</sub>O<sub>3</sub></sup>
    - 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