

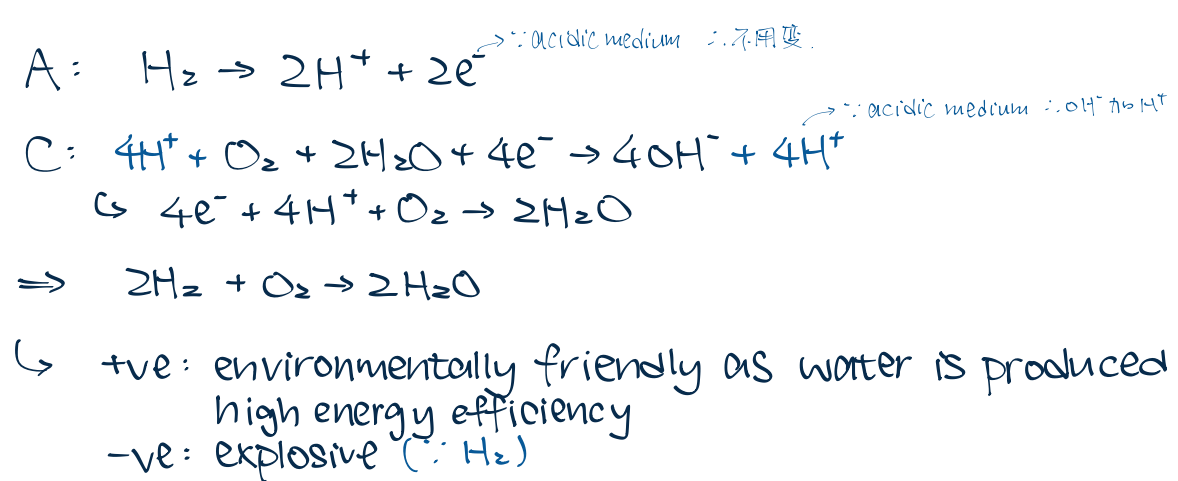
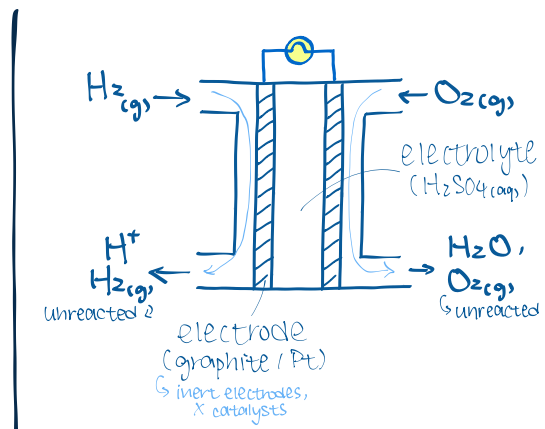
# Fuel cells

## 1 Principle

- Combustion of fuel ( $\text{fuel} + \text{O}_2 \rightarrow \dots$ )
- hazard warning labels: flammable + oxidizing  
fuel (燃料)       $\text{O}_2$  (助燃料)
- advantages
  - > environmentally friendly as water is produced eg. for hydrogen fuel cells
  - > high energy efficiency.
- 注意 electrolyte 为 acidic / alkaline medium
  - > acidic:  $\text{OH}^-$  加  $\text{H}^+$
  - > alkaline:  $\text{H}^+$  加  $\text{OH}^-$
  - > carbonate ( $\text{CO}_3^{2-}$ ): 转做 acidic medium ( $\text{OH}^-$  加  $\text{H}^+$ ), 再加  $\text{CO}_3^{2-}$  ( $2\text{H}^+ + \text{CO}_3^{2-} \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ ) Acid-base

## 2 Examples

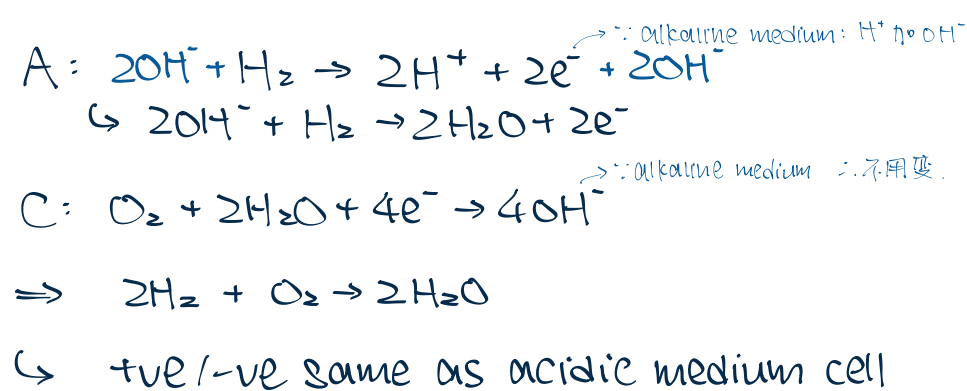
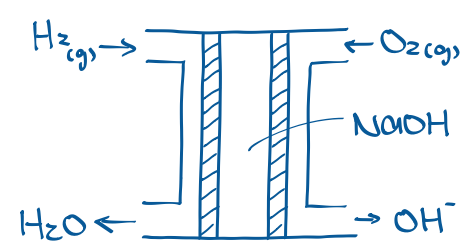
### HYDROGEN FUEL CELLS, ACIDIC MEDIUM



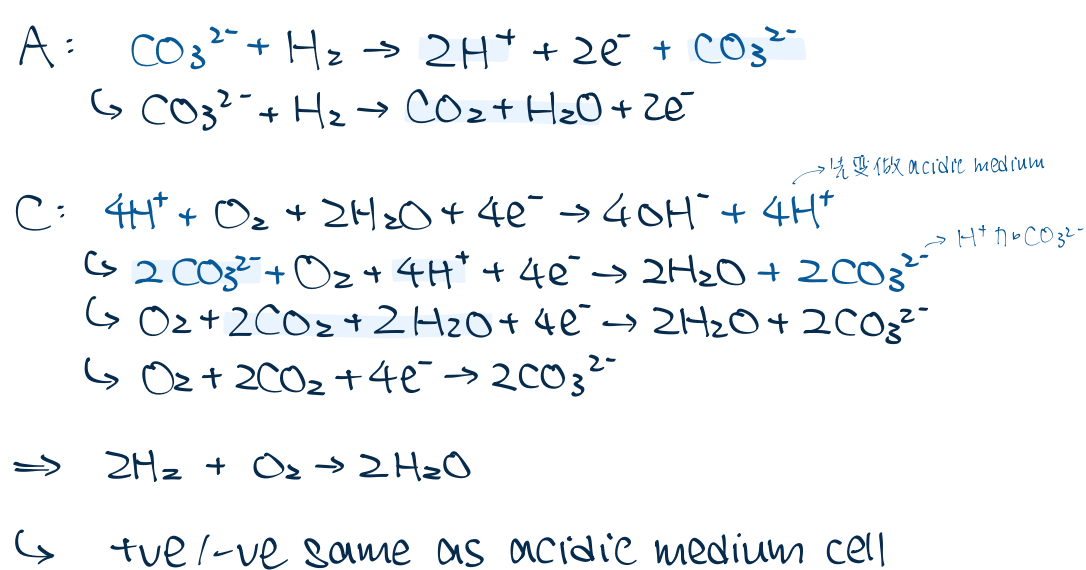
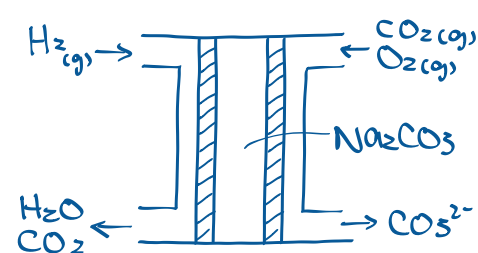
### For hydrogen fuel cells

- overall eqn.
  - > 无论如何也是  $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- Acidic medium
  - > Anode:  $\text{H}^+$ , Cathode:  $\text{H}_2\text{O}$
- Alkaline medium
  - > Anode:  $\text{H}_2\text{O}$ , Cathode:  $\text{OH}^-$

### HYDROGEN FUEL CELLS, ALKALINE MEDIUM



### HYDROGEN FUEL CELLS, CARBONATE MEDIUM



### OTHER FUEL CELLS

