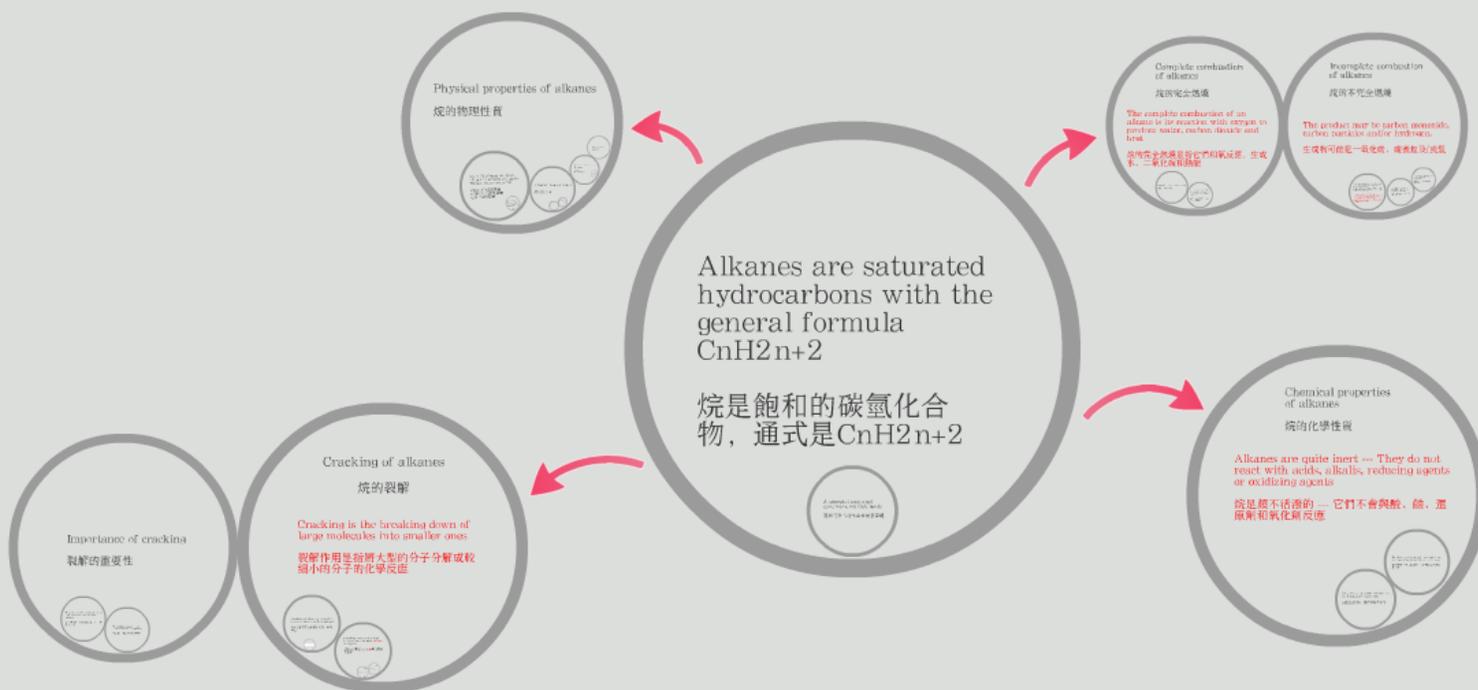
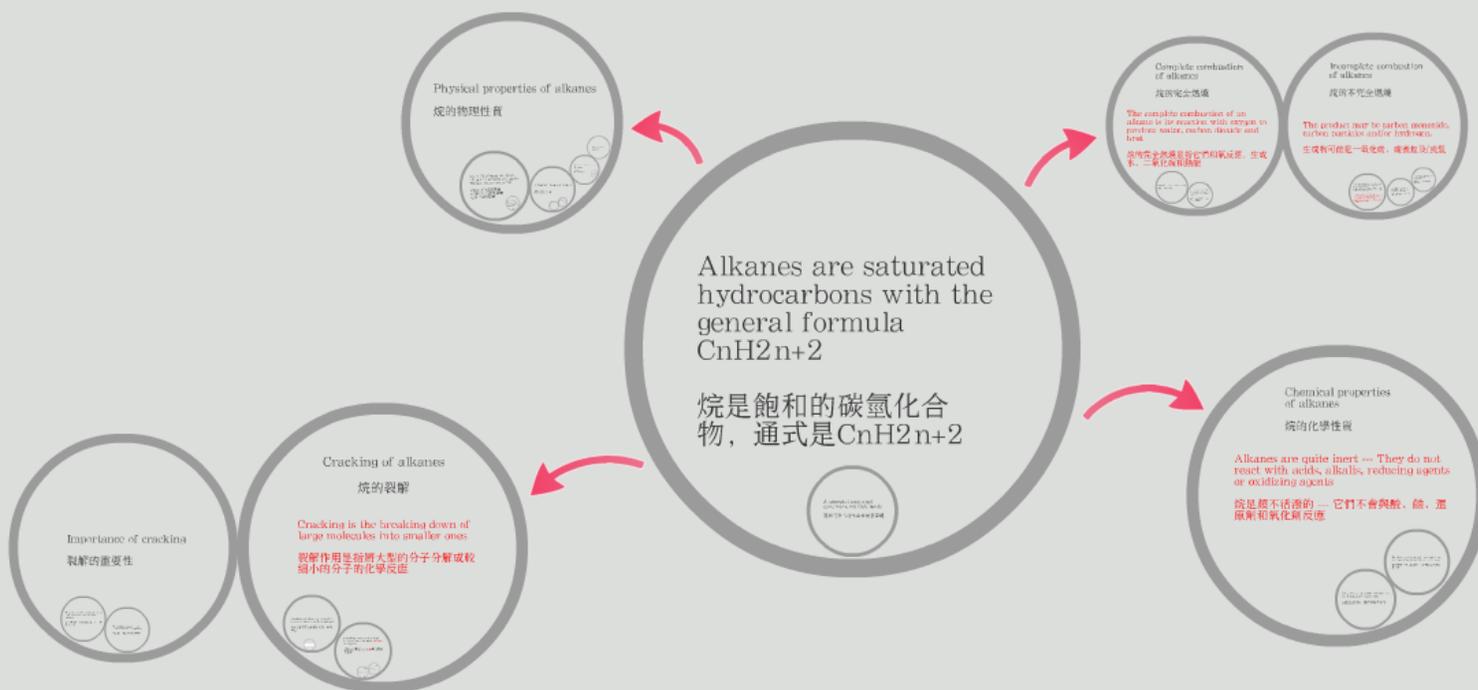


# Alkane 烷



# Alkane 烷



Alkanes are saturated hydrocarbons with the general formula  $C_nH_{2n+2}$

烷是飽和的碳氫化合物，通式是  $C_nH_{2n+2}$

A saturated compound contains no multiple bonds  
飽和的化合物不含任何多重鍵

The complete combustion of an alkane produces water and heat

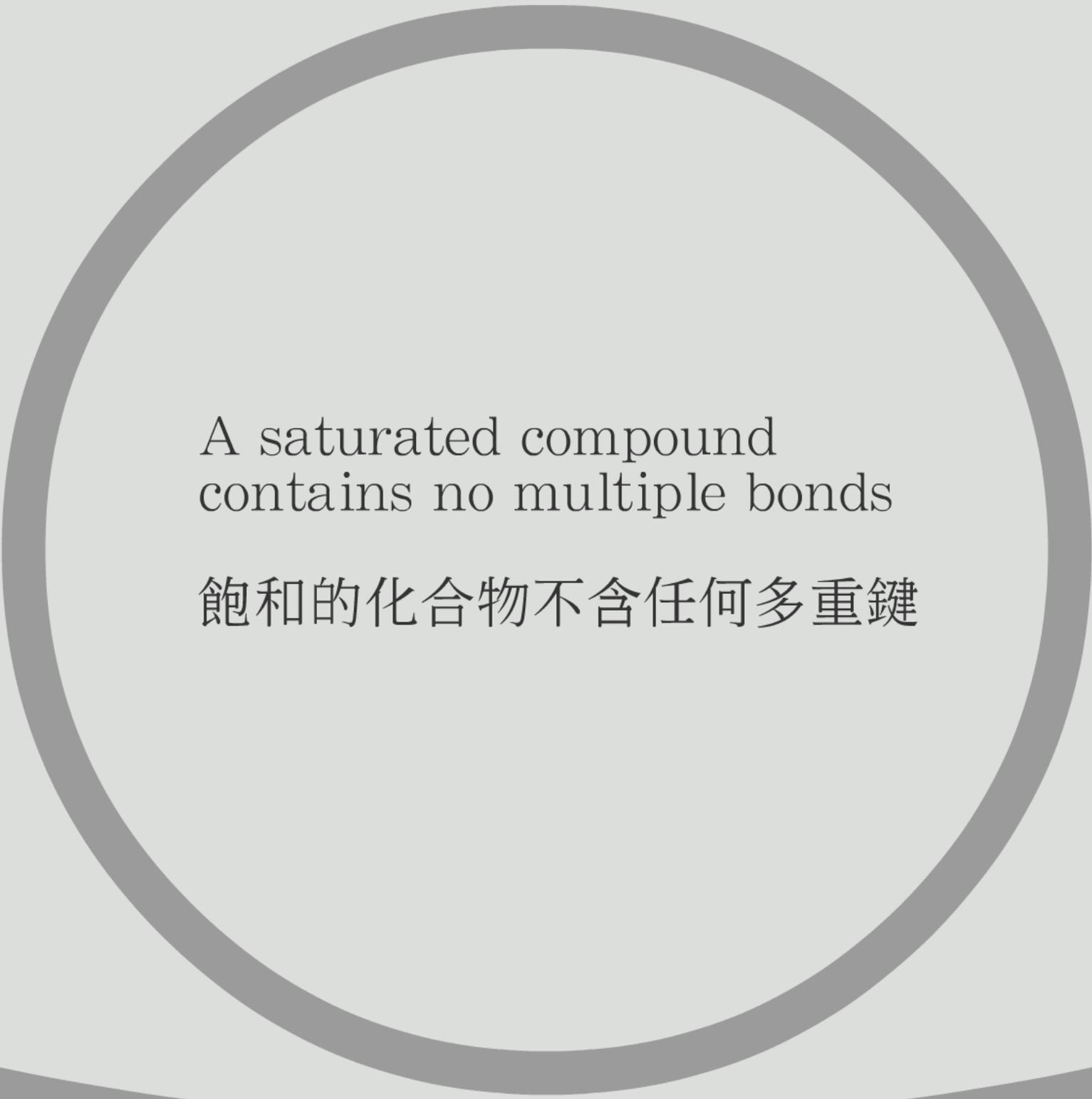
烷的完全燃燒產生水、二氧化碳和熱

Alkanes float on water

烷浮於水面

Alkanes are insoluble in water

烷不溶於水



A saturated compound  
contains no multiple bonds

飽和的化合物不含任何多重鍵

# Physical properties of alkanes

## 烷的物理性質

C1 to C4 alkanes are gases  
C5 to C17 alkanes are liquids  
Higher alkanes are solids

C1至C4的烷是氣體  
C5至C17的烷是液體  
更高的烷是固體

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The boiling point & melting  
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with their no. of C atoms in  
the molecules

烷的沸點和熔點隨着分子內碳  
原子的數目而上升



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烷浮於

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烷的沸點和熔點隨着分子內碳原子的數目而上升

Van der Waals' forces between molecules increases with the molecular size --- A larger molecule results to greater van der Waals' forces

分子間的范德華力隨着分子的大小而上升 --- 分子越大，范德華力越強

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Alkanes are non-polar  
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The densities of alkanes  
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Alkanes are less dense than  
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e than



## Chemical properties of alkanes

### 烷的化學性質

Alkanes are quite inert --- They do not react with acids, alkalis, reducing agents or oxidizing agents

烷是頗不活潑的 --- 它們不會與酸、鹼、還原劑和氧化劑反應

Reactive metals, e.g. sodium or potassium, are stored under paraffin oil or kerosene  
活潑金屬（例：鈉或鉀）被貯藏於石蠟油或煤油中

Alkanes can undergo combustion, cracking and substitution

烷能進行燃燒、裂解和取代作用

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Complete combustion  
of alkanes

烷的完全燃燒

The complete combustion of an alkane is its reaction with oxygen to produce water, carbon dioxide and heat

烷的完全燃燒是指它們和氧反應，生成水、二氧化碳和熱能

Combustion is an exothermic process  
燃燒是一項放熱反應

Alkanes burn with blue (non-luminous) flame in the complete combustion reactions

烷進行完全燃燒時，火焰呈藍色（無光焰）

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# Incomplete combustion of alkanes

## 烷的不完全燃燒

The product may be carbon monoxide,  
carbon particles and/or hydrogen.

生成物可能是一氧化碳、碳微粒及/或氫

gen to  
and

生成

Incomplete combustion is more likely to occur with higher alkanes, as they require more oxygen for combustion.

因為較重的烷需要較多的氧氣進行燃燒，所以出現不完全燃燒的可能性較大。

Natural gas (C1 to C4 alkanes) burns with a blue flame whereas candles (made of wax) burns with a yellow flame.

燃燒天然氣（C1至C4的烷類）時的火焰呈藍色而蠟燭火則是黃色的。

Alkanes burn with sooty, orange/yellow flame in the incomplete combustion.

烷進行不完全燃燒時，火焰呈橙黃色，或帶黑煙。

Incomplete combustion occurs when oxygen supply is insufficient.

當氧氣供應不足時就會出現不完全燃燒。

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# Cracking of alkanes

## 烷的裂解

Cracking is the breaking down of large molecules into smaller ones

裂解作用是指將大型的分子分解成較細小的分子的化學反應

Cracking of alkanes give smaller alkanes, alkenes and/or hydrogen

烷的裂解會生成較細小的烷、烯及/或氫

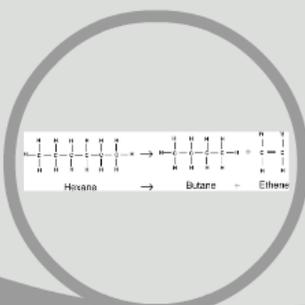
Cracking occurs under high temperature and with **absence** of oxygen

裂解需於高溫及於**沒有**氧的情況下進行



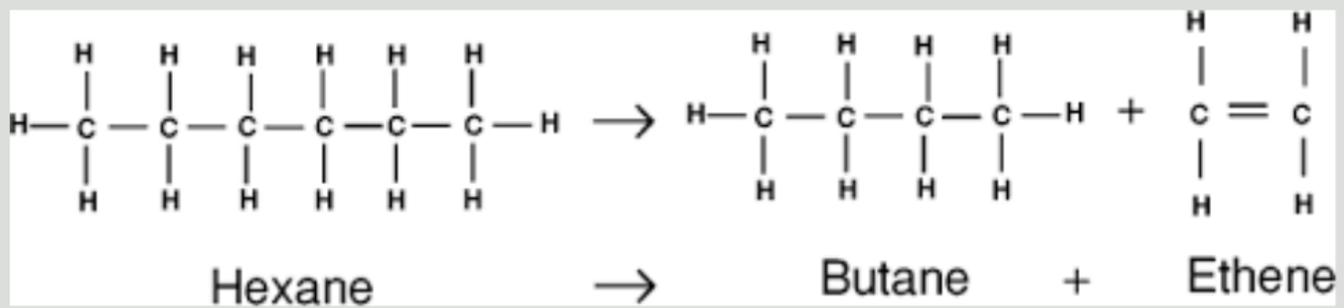
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Catalytic cracking 催化裂解

Cracking by **heat** with the presence of catalyst

在存有催化劑的情況下，**加熱**進行裂解



Thermal cracking 熱裂解

Cracking under high temperature and high pressure

在高溫高壓下進行裂解

Thermal cracking 熱裂解

Cracking under high temperature  
and high pressure

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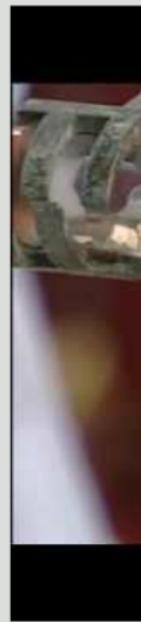
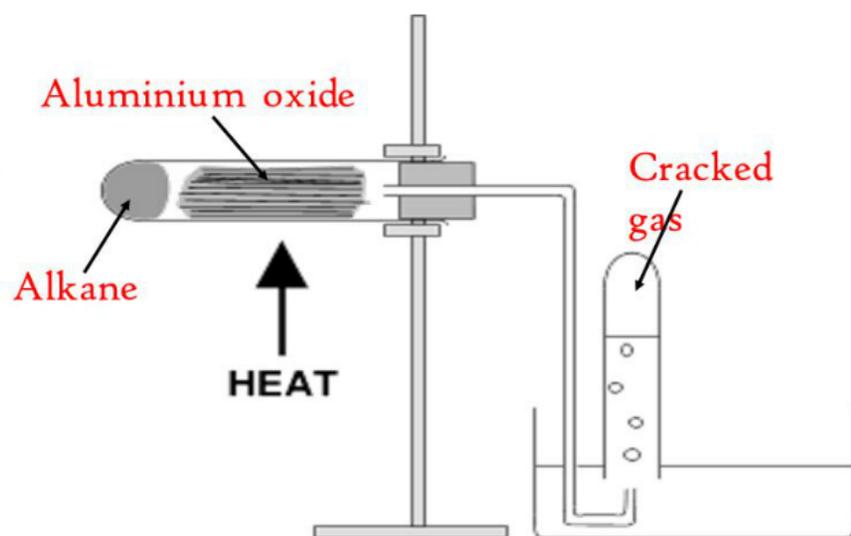
- Can be do

Alumin

Alkane

## Cracking in the Lab

- Can be done in the laboratory:





# Importance of cracking

## 裂解的重要性

To produce extra fuel (e.g. petrol and kerosene) from higher alkanes

從較高烷生產額外的燃料，例：汽油和煤油

To produce alkenes -- raw materials of making plastics

生產烯 -- 製造塑膠的原材料

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