

# 以氫氧化鈉輔助乙炔分解製備碳材料

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## 摘要

本研究是利用氫氧化鈉與乙炔反應，比較在不同實驗條件下，改變四種實驗參數，利用自生成水氣氣泡作為模板，得到孔洞性碳材料，分別是：A 系列反應是調控不同反應溫度，反應溫度從 523 K ~ 873 K ；B 系列是控制乙炔流速，流速由 1.5 sccm ~ 8.3 sccm ；C、D 系列是改變不同反應時間，與乙炔反應 1 小時至反應 9 小時；E、F 系列則改變反應物氫氧化鈉重量，由 1.25 mmole ~ 12.5 mmole 。

本實驗所得到的產物，可經由水洗純化後得到孔洞性碳材料。反應過程中產生的氣體可由動態攝影觀察水氣出現的情形，並利用GC可得知其成分為水。由純化後的產物與氫氧化鈉之莫耳比分別與四個實驗參數做圖可知本反應為一催化反應，利用反應中產生之金屬鈉當催化劑與乙炔反應，此反應斷乙炔碳氫鍵的能量為  $64 \text{ kJmol}^{-1}$ ，使其能在較低反應溫度下形成多孔性碳材，並藉由SEM、EDS、TEM、SAED、XRD、BET和Raman進行特性鑑定與分析。

# Fabrication of Carbon Materials by Sodium Hydroxide Assisted Acetylene Pyrolysis

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## Abstract

This thesis presents the results of porous carbon materials that were prepared by sodium hydroxide and acetylene at the atmospheric pressure. The carbon materials come into being porous structure because of producing steam from sodium hydroxide and acetylene reaction. This experiment was changed four parameters that were divided into A to F parts as follows : Part A, different reaction temperature (573 K~ 723 K). Part B, various acetylene flow rate (1.5 sccm ~ 8.3 sccm). Part C and D, several reaction time (1 h ~ 9 h). Part E and F, diversified reactant weight (1.25 mmole ~ 12.5 mmole).

The products were washed with distilled water during purification and became to porous carbon materials. Producing steam from this reaction was recorded with in-situ observation and was defined as water by GC analysis. It was proved that the reaction is a catalytic reaction by illustrations of C/NaOH molar ratio with reaction temperature. Then, energy of activation of the surface-reaction-controlled kinetics (523 K ~ 723 K) is calculated to be 64 kJ mol<sup>-1</sup>. During the catalytic reaction process, sodium was produced as a catalyst that reacted with acetylene and formed porous carbon materials at lower temperature. Moreover, SEM、EDS、TEM、SAED、XRD、BET and Raman spectra have been used to characterize the product.

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