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# 椰殼活性碳表面特性及其對酚去除能力之影響

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## 摘　要

本研究利用農業廢棄物椰殼爲原料，以硫酸亞鐵爲活化劑，製備高孔隙活性碳。研究中探討活化劑($FeSO_4$)含浸濃度的不同及製備條件不同對於活性碳孔隙結構的影響，如表面積、孔徑大小分佈、孔體積、$N_2$吸脫附特性等，並討論活性碳表面結構的不同對於酚溶液吸附效果之差異。由酚溶液的等溫吸附試驗結果，利用Freundlich吸附方程式描述其吸附行爲，並探討孔洞特性與吸附行爲間之關聯性。研究結果發現，活性碳的表面積和孔隙體積隨著活化劑濃度增加而減少，而表面平均孔徑則會隨之增大，結果顯示含浸劑濃度增加時，會增加活性碳之中孔比例。酚溶液的等溫吸附試驗中，由Freundlich吸附方程式的吸附平衡常數(k)與動力級數(n)得知，k與n值與活性碳表面積大小具有正比之關係，且於酚的吸附試驗中發現以低濃度活化劑所活化的活性碳具有較好的吸附能力與吸附容量。

關鍵詞：椰殼、活性碳、表面積、等溫吸附、酚

## 前　言

活性碳(activated carbon)爲一多孔性物質，在環境工程應用中，經常被應用在水與廢水或工業廢氣的有機污染物的去除。在不同的原料(如椰殼、蔗渣、稻殼)和不同製作條件下(如活化劑濃度、活化溫度、升溫速率等)可製出其不同直徑之孔洞分佈與中孔及微孔構造[1]，通常活性碳的比表面積可達500~1500$m^2/g$，由於活性碳本身擁有高表面積之特性，故適用於吸附有機污染物[2]。活性碳之原料選取，可以高碳及低無機物含量的物質作爲原料，經適當之製作程序，已研製出各種活性碳[3-4]。

國內目前每年約有30萬噸的椰殼廢棄物[5]，基於廢棄物資源化的原則，所以本研究則以化學活化方法碳化椰殼，以製出活性碳，並比較在不同化學含浸濃度下其孔洞的差異，及其吸附能力的比較分析。以利找出良好的活性碳製備程序並得到吸附能力佳的活性碳。希冀能解決農業廢棄物之處置問題，同時又能達到廢棄物資源化之目的。

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# ABSTRACT

## Surface Properties of Activated Carbons from Coconut Shell and Their Effects on the Phenol Removal

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### ABSTRACT

**High sorption performances of activated carbons were prepared by agricultural waste (coconut shell) with iron sulfate ($FeSO_4$) as an activation agent. The high porosity structure of activated carbon can be achieved by various preparing conditions, such as concentration of activation agent and the final activation temperature. The high porosity of activated carbon was used to remove the toxic effluent, phenol was used as a target pollutant. This study investigated the effect of preparing conditions on the surface area, pore distribution, pore volume and the sorption isotherm of activated carbon. The relationship between the pore properties of activated carbon and phenol removal was studied by the sorption experiments. It was found that the surface area and pore volume decreased with increasing the concentration of activation agent. The high surface area of activated carbon induced a high removal of phenol in sorption experiment. The Freundlich equation was applied to describe the sorption behavior of activated carbon in the phenol solution. It was found that both of equilibrium constant (k) and affinity (n) values proportionate to the surface area of activated carbon. It was concluded that the higher surface area activated carbon owned a good sorption capacity. A good sorption application for phenol removal in aqueous solution was found in this investigation.**

**Key words: Coconut shell, Activated carbon, Surface area, Adsorption isotherm, Phenol.**