

後清洗對可可莢殼衍製活性炭特性之影響

**Influence of post-washing on the
characterization of activated carbon
prepared from cocoa pod husk**

Shih-Hsuan Chang and Wen-Tien Tsai*

張世軒、蔡文田*

Graduate Institute of Bioresources,

National Pingtung University of Science and Technology

國立屏東科技大學農學院生物資源博士班

本研究是將物理活化所製得的可可莢殼活性碳(ACCS)，經過酸水洗後對其孔洞特性的影響。研究結果發現，在800°C活化的條件下，經過水洗處理過後，其比表面積(S_{BET})從534.63 m²/g上升至1151.33 m²/g，真密度從2.166 g/cm³上升至2.238 g/cm³，並且隨著活化溫度的提高及活化時間增加，雖其產率變少，但其孔洞特性則是呈現升高的正相關係，而得到的比表面積值也相對的越高，最高可達1,793 m²/g之活性碳。

This study investigated the effect of post-washing on the pore characteristics of cocoa pod husk activated carbon (ACCS) produced from physical activation. The experiments were carried out under different activation temperatures (600°C–850°C) and residence times (0–90min) at a fixed gas (CO₂-100 cc/min). The experimental findings showed that the specific surface area (BET) increased from 534.63 m²/g to 1151.33 m²/g for the resulting activated carbon produced at activation temperature of 800°C for 30min and post-washing with water. In addition, the true density indicated an increasing trend as the activation temperature and residence time increased, but the product yield will be reduced. The maximal BET surface of ACCS product obtained at activation temperature of 850°C for 30min and post-washing with 0.25M HCl was 1,793 m²/g.

表1、不同活化溫度的活性碳在酸水洗前後之比表面積。

Table 1. Comparison of specific surface area for activated carbons prepared at different activation temperatures and by post-washed methods.

活化溫度(°C)	比表面積(m ² /g)		
	未酸洗	水洗	酸洗
750	347.26	787.70	838.16
800	534.63	1151.33	1320.94
850	432.68	1454.86	1793.74

- 孔洞特性隨著活化溫度增加有上升的趨勢
- 溫度越高收率越低，且也會降低未酸洗之品質
- 酸水洗處理會使的孔洞更加發達
- 酸洗比水洗越能體現孔洞特性

表2、於750°C下不同停留時間所產製活性碳之收率與孔洞特性

Table 2. Yields and pore properties of resulting activated carbons (ACCS) prepared by different holding times and at 750°C .

Activated carbon	Yield (wt%)	S_{BET} (m^2/g)	V_t (cm^3/g)	ρ_s (g/cm^3)	ρ_p (g/cm^3)	ϵ_p (g/cm^3)
ACCS-750-00	39.98	23.73	0.0205	1.770	1.708	0.035
ACCS-750-30	26.44	347.26	0.1968	1.875	1.370	0.270
ACCS-750-60	18.91	415.82	0.2252	1.980	1.369	0.308
ACCS-750-90	17.52	288.07	0.1762	1.655	1.281	0.226

結論

- ➔ 可可莢殼雖含高鉀量，但尚含高碳量，乃適合作為活性碳之前驅原料。
- ➔ 可可莢殼所製得之活性碳，物理活化溫度越高所所得數據則呈現正相關性，活化時間越長則比表面積越高，但是最長不要超過60分鐘。
- ➔ 可可莢殼所製得之活性碳經過的酸水洗，明顯大於未酸洗之比表面積。故製成活性碳後，加工處理去除灰份等礦物質是必須的。
- ➔ 經上述程序可得到的比表面積最高達 $1,793 \text{ m}^2/\text{g}$ 之微孔性活性碳。