

**An Investigation of Surface Fractal Characteristics of
Microporous Carbon Specimens Using HRTEM**

고분해능 투과전자현미경을 이용한 마이크로포러스 카본시편의
표면 프랙탈 특성에 관한 연구

이경자 · 변수일

한국과학기술원 신소재공학과

Surface fractal characteristics of microporous carbon specimens were investigated using nitrogen gas adsorption method and high resolution transmission electron microscopy (HRTEM). For this purpose, the carbon powder specimens with various surface fractal dimensions were prepared by reactivation of the commercially as-activated carbon powder at 1000 °C in an atmosphere of a CO₂/CO gas mixture for different activation times. The pore structure parameters such as total surface area, average pore diameter and pore size distribution were determined with help of nitrogen gas adsorption at 77 K. The surface fractal dimensions of the carbon specimens were evaluated by image analysis of HRTEM images using perimeter-area method. From the results of the image analysis of HRTEM images, it was found that (log perimeter - log area) plots obtained from all the carbon specimens displayed two straight lines with different slopes that can be divided into regions I and II, indicating multifractal geometry of the carbon specimens. The pore diameter at the transition point from regions I to II was estimated to be about 0.5 nm, which corresponds to the transition pore diameter from ultramicropores to supermicropores. The individual surface fractal dimensions of the ultramicropore surfaces in region I were much smaller in value than those of the micropore surfaces in region II. In addition, the individual surface fractal dimensions of the ultramicropore surfaces were almost the same for all the carbon specimens. On the other hand, the surface fractal dimensions of the supermicropore surfaces were strongly affected by activation time, which is due to the change of pore surface irregularity with the degree of burn-off.

Reference

1. G.-J. Lee, S.-I. Pyun and C.-H. Kim, J. Solid State Electrochem., 8 (2004) 110.