



# Sulfur-encapsulation in carbon nanotubes

Shuwen WANG, Hedeki TANAKA  
信州大学工学部先鋭材料研究所 (RISM)

キーワード : X-ray diffraction, crytallinity, amorphous disorder

## 1. 背景と研究目的

The present experiment is a continuous work of 201906053 and 201906161.

We have studied the X-ray diffraction of sulfur confined in slit-shaped pores. In the present study we investigate the electron radial distribution function (ERDF) of sulfur confined in nanotubes by using their X-ray diffraction.

## 2. 実験内容

Sulfur was encapsulated in a series of carbon nanotubes (EC1.5, EC2.0, SWCNH) of different diameters. The XRD patterns of carbon nanotubes, sulfur-loaded carbon nanotubes before and after CS<sub>2</sub> washing were measured at Aichi SR.

## 3. 結果および考察

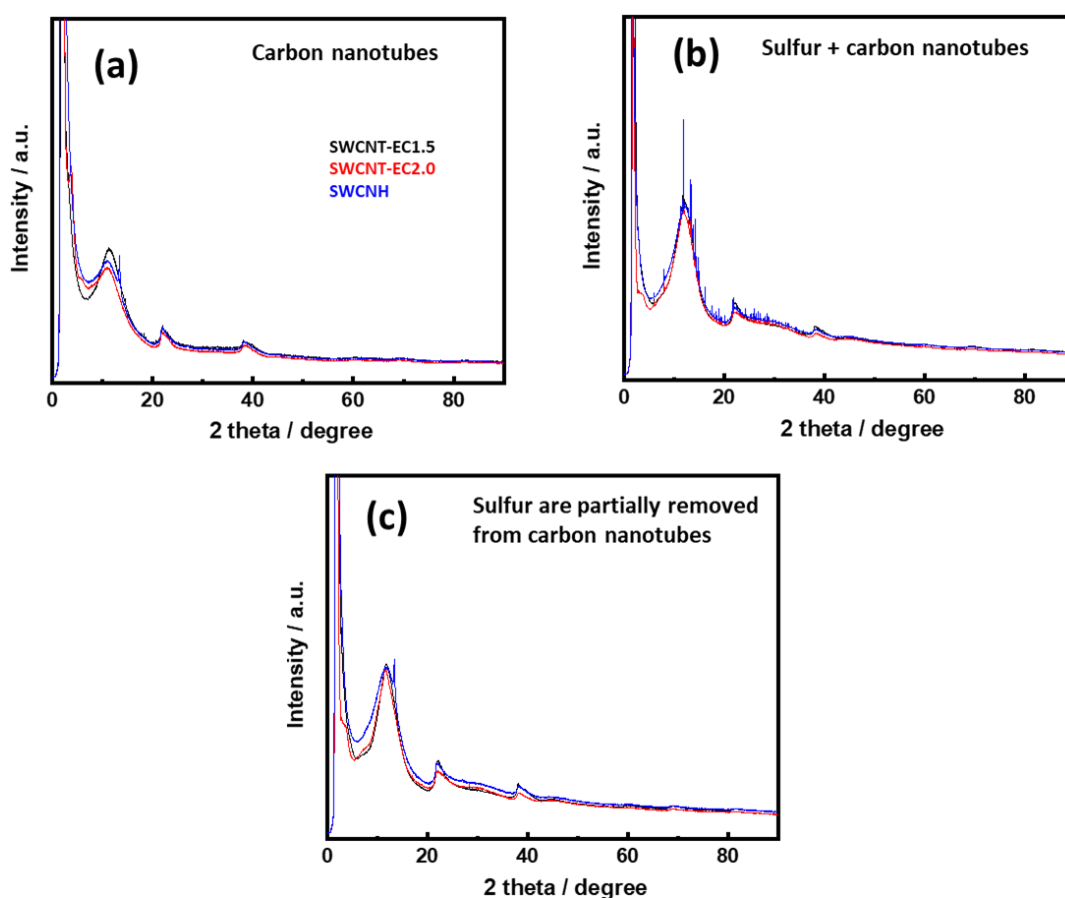


Fig. 1 XRD patterns of (a) pristine carbon nanotubes, sulfur-loaded carbon nanotubes (b) before and (c) after CS<sub>2</sub> washing. Sulfur encapsulated in EC1.5: black, sulfur encapsulated in EC2.0: red, sulfur encapsulated in SWCNH: blue.

Figure 1 shows the XRD patterns of pristine and sulfur-loaded carbon nanotubes. After washing by CS<sub>2</sub>, the sulfur-loaded carbon nanotubes don't have any extra peaks compared with the pristine carbon nanotubes, suggesting the confined sulfur is in amorphous state. On the other hand, the XRD patterns show significant hump between 20 to 40 degree after the sulfur encapsulation. We subtracted the sulfur-loaded carbon nanotubes by the pristine carbon nanotubes, then the X-ray diffraction information of the encapsulated sulfur can be obtained, through which the electron radial distribution functions can be calculated by using the Fourier transformation. The obtained result is shown in Figure 2.

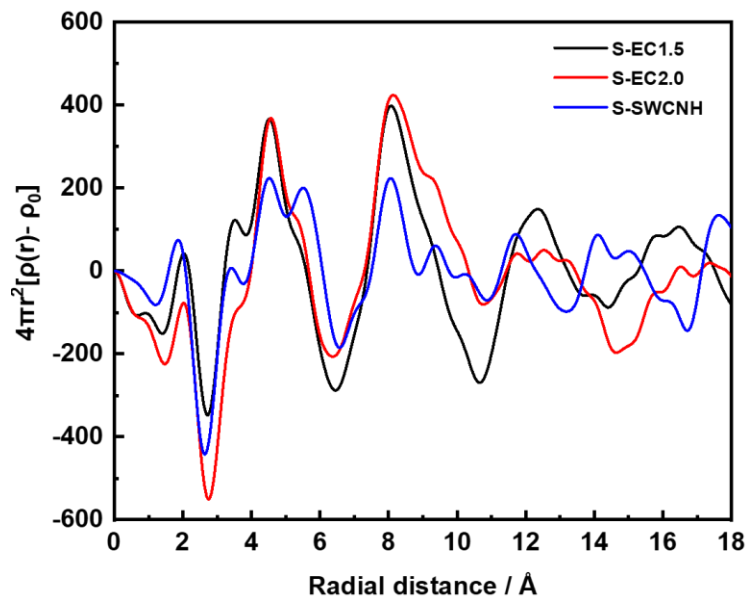


Fig. 2 The electron radial distribution functions of sulfur encapsulated in EC1.5, EC2.0 and SWCNH.