

# フラーレンC<sub>60</sub>とその誘導体の観察と計測

Observation and Measurement of fullerene C<sub>60</sub> and its derivatives

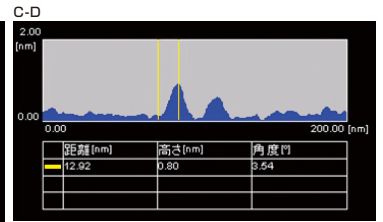
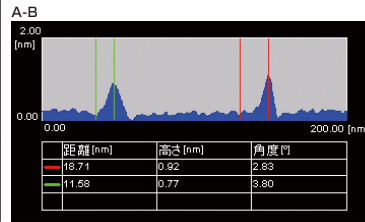
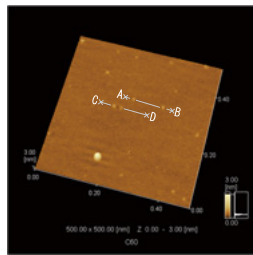
フラーレンC<sub>60</sub>は炭素原子60個からなるサッカーボール型の構造を持っています。それらを誘導体化することにより、代替液晶材料、キャパシタ・電極材料など、工業材料への応用研究が積極的に展開されています。ここではC<sub>60</sub>とその誘導体をSPMで観察し、粒子径を測定した例をご紹介します。

Fullerene C<sub>60</sub> has a structure with sixty carbon atoms puff of soccer ball shape. Application research is actively conducted for industrial materials, such as alternative liquid crystal, capacitors and electrodes by derivatizing C<sub>60</sub>. Here, we introduce example of measurement of C<sub>60</sub> and its derivatives using SPM.

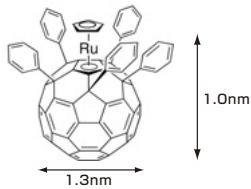
C<sub>60</sub>及びその誘導体は超音波振動によりトルエンに分散した後、濃度を調整してマイカ基板上に滴下乾燥し、そのままSPM観察しています。直径計測では、探針の太さを考慮し、水平方向ではなく垂直方向の高さを用いて計測しています。C<sub>60</sub>の径が約1nmであり、誘導体化後のC<sub>60</sub>はそれぞれの構造を反映して大きく計測されています。

After we dispersed C<sub>60</sub> and its derivatives in toluene using ultrasonic vibration, we adjusted its concentration and dried after dropping it on mica base plate, and observed it using SPM. Diameter was measured using its vertical height, not horizontal height, considering the size of the probe. The diameter of C<sub>60</sub> was about 1nm and the diameters of its derivatives were larger than C<sub>60</sub> reflecting their structures.

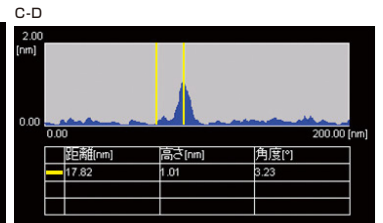
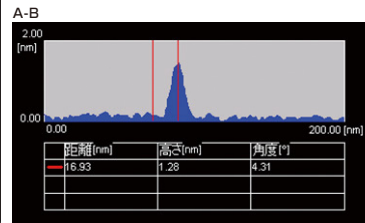
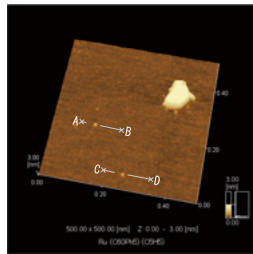
## 1. C<sub>60</sub> (未修飾) (unmodified)



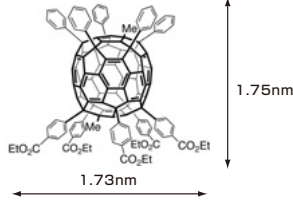
## 2. C<sub>60</sub>誘導体 derivative Ru(C<sub>60</sub>Ph<sub>5</sub>)(C<sub>5</sub>H<sub>5</sub>)



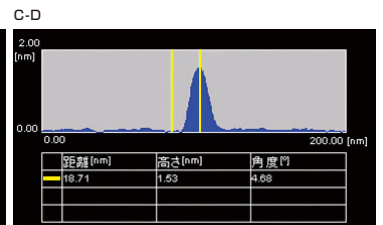
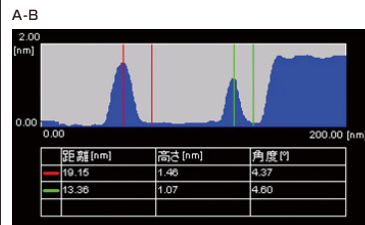
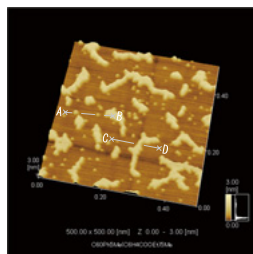
Y. Matsuo, Y. Kuninobu, S. Ito, and E. Nakamura  
Chem. Lett. 2004, 33, 68.



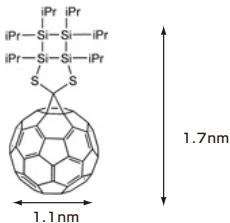
## 3. C<sub>60</sub>誘導体 derivative C<sub>60</sub>Ph<sub>5</sub>Me(C<sub>5</sub>H<sub>4</sub>COOEt)<sub>5</sub>Me



Y. Matsuo, K. Tahara, M. Sawamura, and E. Nakamura  
J. Am. Chem. Soc. 2004, 126, 8725.

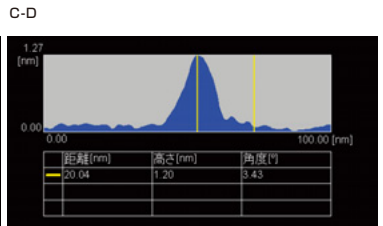
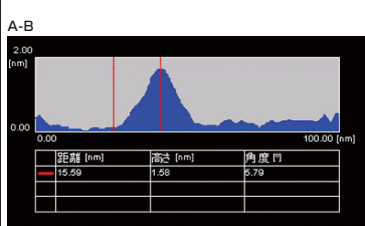
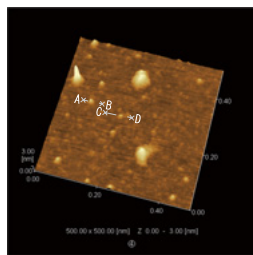


## 4. C<sub>60</sub>誘導体 derivative C<sub>60</sub> [CS<sub>2</sub>Si<sub>4</sub>(iPr)<sub>5</sub>]



H. Nikawa, et al. Angew. Chem. Int. Ed. Engl. 2005, 117, 7739.

2~4の構造体の図中の値はX線結晶構造解析装置による  
The values of structural body images 2~4 are measured  
by X-ray crystal structural analysis system.



試料1: MTR製 純度: 99.95%  
Material 1 supplied by MTR purity: 99.95%  
試料2, 3: 提供: 科学技術振興機構 ERATO中村浩吉炭素クラスタープロジェクト 松尾豊先生  
Material 2 and 3 were provided by Dr. Yukihiro Mizuno, Nakamura Functional Carbon Cluster Project, ERATO, JST  
試料4: 提供: 筑波大学 先端学際領域研究センター 赤阪健先生  
Material 4 was provided by Prof. Akasaka, TARA (Tsukuba Advanced Research Alliance), Tsukuba University