

## 2D 共役共有結合有機骨格(COF)の自己組織化による 1D 電子伝導性ナノチューブへの in-situ 変換

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In-situ transformation of two-dimensional conjugated covalent organic framework (COF) sheets was achieved by a simple "roll-to-sheet" self-assembly protocol, mimicking interconvertible carbon allotropes of two-dimensional (2D) graphene and one-dimensional (1D) carbon nanotubes. An use of azapyrene instead of pyrene as a building block of the COF was the key to achieve the transformation, leading to COF nanotubes with uniform cross-sectional diameters. Substituting the 2,7 carbons in pyrene with nitrogens gave contrasting optical and electronic properties reflecting the coiled structure of the conjugated 2D sheet. The nanotubes exhibited semiconducting properties and provided stable conductive pathways along the tubular axes under ambient conditions.

**Keywords :** Covalent organic framework, Nanotubes

2次元(2D) グラフエンと1次元(1D)カーボンナノチューブの相互関係を模し、本研究では溶媒界面における2D共役共有結合有機骨格(COF)シートを「ロール」させ、簡便に1Dナノチューブ構造へin-situ変換する方法について報告する。ピレンCOFの2,7位の炭素を窒素で置換したアザピレンを用いると、2次元重合過程において、断面直径が均一な同軸ナノチューブを与える。この1Dナノチューブの物性はロール状構造を反映し、ピレンCOF結晶とは対照的な光学および電子特性を示した。空气中で安定した電子伝導経路を持つ半導体性を示し、アザピレンの窒素中心を利用した安定な電荷キャリアドーピングにより、高い伝導性を付与できることが明らかとなった。

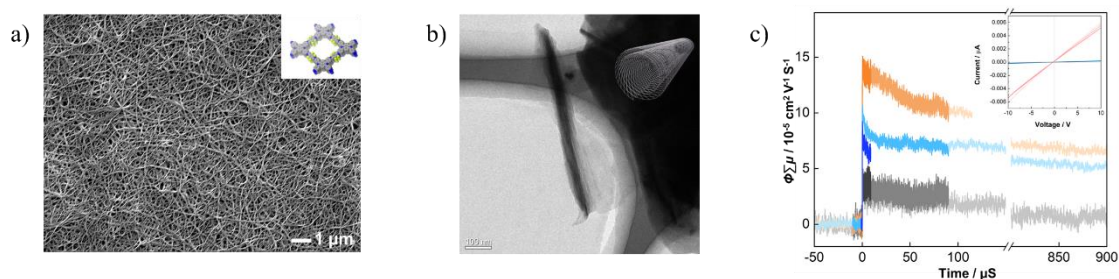


Figure 1. a) SEM/schematic of Aza-1PF COF tubular film, b) TEM/schematic morphology of Aza-1PF COF tubule, and c) Transient/static electronic conductivity of Aza-1PF film and Aza-1PF film with the dopant.