

Research highlights

Growth of ~50 nm-diameter multi-walled carbon nanocoils

Carbon nanocoils (CNCs) are composed of helical shaped carbon nanofibers and show promise as fillers, electromagnetic wave absorbers, and tactile sensors.

However, in spite of the tremendous efforts to produce contrary, the vast majority of CNCs are amorphous, exhibiting larger fiber and coil diameters than carbon nanotubes.

In an attempt to resolve this issue, Masashi Yokota and colleagues at Toyohashi University of Technology in Japan report the growth of thin CNCs with coil diameters of 50 nm by catalytic chemical vapor deposition (CCVD).

The thin CNCs were synthesized by the following procedure: mixing Fe and Sn powders and Y-type zeolite in dilute hydrochloric acid solution; sonicating the resulting solution and drying in a furnace; passing a gas mixture of C₂H₂/N₂ over the zeolite with the Fe and Sn catalysts in a quartz tube reactor at 700°C.

The thin CNCs had fiber and coil diameters of 15 nm and 50 nm, respectively, with a hollow and multi-walled structure of cylindrical graphitic layers. The researchers refer to the thin CNCs as 'multi-walled CNC', which had a left hand helix that was confirmed by electron tomography.

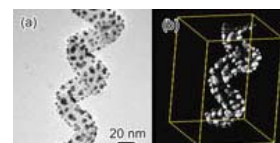
Reducing the diameter of the CNCs induced the structural changes from amorphous to graphitic, which implies the enhancement of the electrical as well as mechanical characteristics. This multi-walled CNCs may find applications in battery technology and nanoelectromechanical systems.

Reference:

- Masashi Yokota, Yoshiyuki Suda, Hirofumi Takikawa, Hitoshi Ue, Kazuki Shimizu, and Yoshito Umeda.
- Structural analysis of multi-walled carbon nanocoils synthesized with Fe-Sn catalyst supported on zeolite.
- *Journal of Nanoscience and Nanotechnology* **11**, 2344–2348 (2011).
- Digital Object Identifier (DOI): 10.1166/jnn.2011.3126
- Department of Electrical and Electronic Information Engineering, Toyohashi University of Technology.
- Department website: <http://www.tut.ac.jp/english/introduction/department02.html>



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Figure caption: Electron tomography of a multi-walled carbon nanocoil (MWCNC). (a) TEM micrograph of the MWCNC coated with Au nanoparticles. (b) Reconstructed 3D image of the MWCNC.