

Importance of Carbon Nanotube Solubilization and Functionalization

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We first introduce our strategy and importance of carbon nanotube solubilization and functionalization, and then mainly focus on our studies including the following three topics.

Topic 1: Determination of precise electronic states of individually dissolved (n,m)single-walled carbon nanotubes (SWNTs) and their empirical prediction. Electronic structures of SWNTs, one of the fundamental features of nanotubes, strongly depend on the chirality of the nanotubes. We have discovered that we can determine the precise electronic states of isolated SWNTs having their own chirality indices by in situ near-IR photoluminescence spectroelectrochemistry at the fabricated modified ITO electrode. We also present empirical equations that predict electronic states of (n,m)SWNTs. □

Topic 2: Rational concept to recognize/extract single-walled carbon nanotubes with a specific chirality. The facile separation of a mixture of SWNTs into specific chirality components has recently attracted great attention. We report that certain chiral polyfluorene copolymers can well recognize SWNTs with certain chirality preferentially, leading to solubilization of specific chiral SWNTs.

Topic 3: Development of remarkably durable high temperature polymer electrolyte fuel cell. Low durability of polymer electrolyte fuel cell (PEFC) is a major drawback that should be solved. We report the finding that a novel PEFC free from acid leaching shows remarkable high durability (single cell test: .400,000 cycling) together with a high power density at 120 degree Celsius under a non-humidified condition. Such a high performance PEFC opens the door for the next-generation PEFC for “real world” use.

ABOUT THE SPEAKER

Naotoshi Nakashima received his PhD in 1981 at Kyushu University. He started to work as an Assistant Professor in 1980 at Kyushu University, and then was promoted to an Associate Professor at the same University in 1982. He moved to Nagasaki University in 1987 and was promoted to a professor there in 1993. He moved back to Kyushu University in 2004 as a Professor of Department of Applied Chemistry, Graduate School of Engineering. Since 2017, He is a Professor of International Institute for Carbon-Neutral Energy Research, Kyushu University (HP: <http://i2cner.kyushu-u.ac.jp/ja/>).

His current research interests are the design and functionalization of carbon nanotubes and supramolecular nanomaterials. He earned “The Chemical Society of Japan (CSJ) Award for Young Chemists in 1986”, “The Award of the Society of Polymer Science, Japan in 2000”, “2007 Thomson Scientific Research Front Award”, “The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology in 2016”, and “SPSJ Award for Outstanding Achievement in Polymer Science and Technology in 2016”.

Prof. Nakashima published over 320 papers in academic journals such as *Nature Communications*, *Scientific Reports*, *J. Am. Chem. Soc.*, *J. Mater. Chem. A*, *ChemComm*, *Macromolecules*, *Chem. Eur. J.*, *Nanoscale*, *Small*, *J. Phys. Chem. C*, *Langmuir*, *Chem. Lett.*, *Bull. Chem. Soc. Jpn.*, *ChemCatChem*, *ACS Appl. Mater. Interfaces*, *Polymer Chem.*, *Electrochem. Acta*, *RSC Adv.*, *Adv. Mater. et al.*