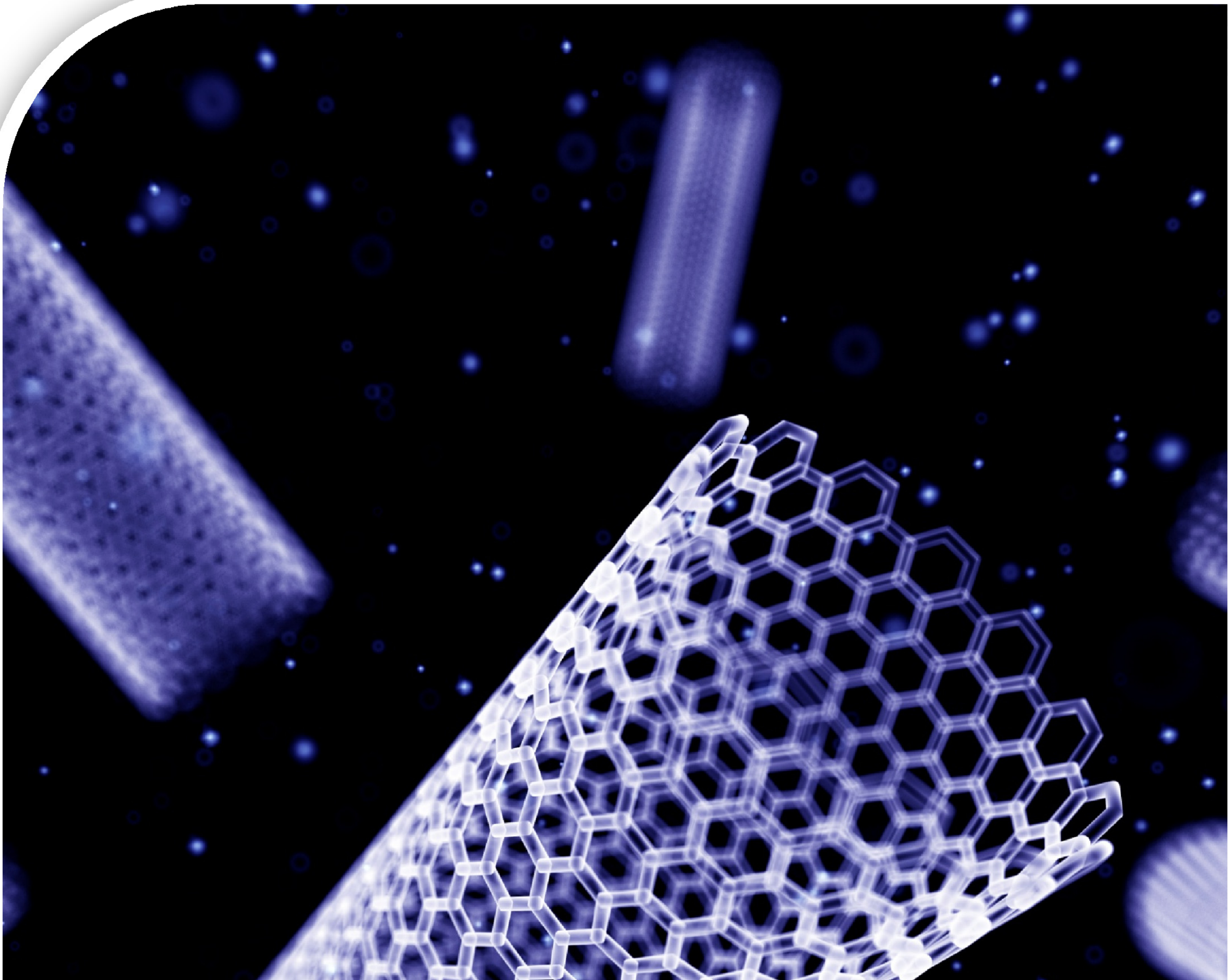

ACS/CSJ Joint Symposium on Nanocarbon

in Honor of ACS President; *Donna Nelson*

The Chemical Society of Japan
The 96th Annual Meeting
March 26, 2016
Kyotanabe Campus, Doshisha University
Kyoto, Japan

ACS
Chemistry for Life®

ACS/CSJ Joint Symposium on Nanocarbon in Honor of ACS President; *Donna Nelson*

Organized by Satomi Niwayama, Presiding Satomi Niwayama

Date: March 26th, (Sat) 2016 9:00-11:45

Venue: Kyotanabe Campus, Doshisha University, Kyoto, Japan

The Chemical Society of Japan

The 96th Annual Meeting

Co-hosted by the American Chemical Society; ACS and
the Chemical Society of Japan; CSJ

Program

9:00-	Opening Remarks by the Organizer; Satomi Niwayama (Muroran Insititute of Technology), and the CSJ President-Elect; Hisashi Yamamoto (Chubu University)		
9:05-	Science of Finite Carbon Nanotube Molecules	Hiroyuki Isobe Tohoku University, Japan	····1
9:25-	Carbon Nanotube-Nanowires	Hisanori Shinohara Nagoya University, Japan	····3
9:45-	Design and Creation of Carbon Nanotube-based Next-Generation Nanomaterials	Naotoshi Nakashima Kyushu University, Japan	····5
10:05-	Dihalopolyynes: Building Carbon Materials from the Bottom Up	Nancy Goroff Stony Brook University, USA	····7
	Break		
10:40-	Single-molecule Nanotubes, Graphene Nanoribbons, and a New Form of Carbon	Kenichiro Itami Nagoya University, Japan	····9
11:00-	Chemistry at Nano and Mesoscopic Interfaces	Eiichi Nakamura University of Tokyo, Japan	····11
11:20-	Functionalization and Characterization of Single-Walled Carbon Nanotubes by using NMR	Donna Nelson ACS President, University of Oklahoma, USA	····13
11:40-	Closing Remarks by Donna Nelson and the Organizer; Satomi Niwayama		

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➢ Educational Background

1994 B.Sc., Tokyo Institute of Technology (supervisor: Prof. E. Nakamura)
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1999 Ph.D., University of Tokyo

➢ Professional Career

1998-2004 Assistant Professor, University of Tokyo
2003-2007 JST PRESTO Researcher
2004-2007 Associate Professor, University of Tokyo
2007-2016 Professor, Department of Chemistry, Tohoku University
2013 Principal Investigator, Advanced Institute for Materials Research, Tohoku University
2013 Director, JST ERATO Isobe Degenerate π-Integration Project (concurrent)
2016 Professor, Department of Chemistry, The University of Tokyo (from April)

➢ Research Interests

Physical Organic Chemistry; Structural Chemistry

➢ Awards

2000 1st IUPAC Prize for Young Chemists
2004 Chemical Society of Japan Award for Young Chemists
2008 The Young Scientists' Prize (The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology)
2009 Nozoe Memorial Award for Young Organic Chemists
2016 Chemical Society of Japan Award for Creative Work

➢ Recent Publications

1. Aromatic hydrocarbon macrocycles for highly efficient organic light-emitting devices with single-layer architectures, Xue, J. Y.; Izumi, T., Yoshii, A.; Ikemoto, K.; Koretsune, T.; Akashi, R.; Arita, R.; Taka, H.; Kita, H.; Sato, S.; Isobe, H. *Chem. Sci.* **2016**, published online. (doi:10.1039/C5SC03807C)
2. Belt-shaped cyclonaphthylenes, Sun, Z.; Sarkar, P.; Suenaga, T.; Sato, S.; Isobe, H. *Angew. Chem. Int. Ed.* **2015**, *54* (43), 12800-12804.
3. Chimeric RNA oligonucleotides with triazole and phosphate linkages: Synthesis and RNA interference, Fujino, T.; Kogashi, K.; Okada, K.; Mattarella, M.; Suzuki, T.; Yasumoto, K.; Sogawa, K.; Isobe, H. *Chem. Asian J.* **2015**, *10* (12), 2683-2688.
4. Solid-state structures of peapod bearings composed of finite single-wall carbon nanotube and fullerene molecules, Sato, S.; Yamasaki, T.; Isobe, H. *Proc. Natl. Acad. Sci. U.S.A.* **2014**, *111* (23), 8374-8379.
5. Geometric measures of finite carbon nanotube molecules: A proposal for length index and filling indexes, Matsuno, T.; Naito, H.; Hitosugi, S.; Sato, S.; Kotani, M.; Isobe, H. *Pure Appl. Chem.* **2014**, *86* (4), 489-495.
6. Bottom-up synthesis and thread-in-bead structures of finite (*n*,0)-zigzag single-wall carbon nanotubes, Hitosugi, S.; Yamasaki, T.; Isobe, H. *J. Am. Chem. Soc.* **2012**, *134* (30), 12442-12445.
7. Bottom-up synthesis of finite models of helical (*n,m*)-single-wall carbon nanotubes, Hitosugi, S.; Nakanishi, W.; Yamasaki, T.; Isobe, H. *Nat. Commun.* **2011**, *2* (10), doi: 10.1038/ncomms1505 (5 pages).

Science of Finite Carbon Nanotube Molecules

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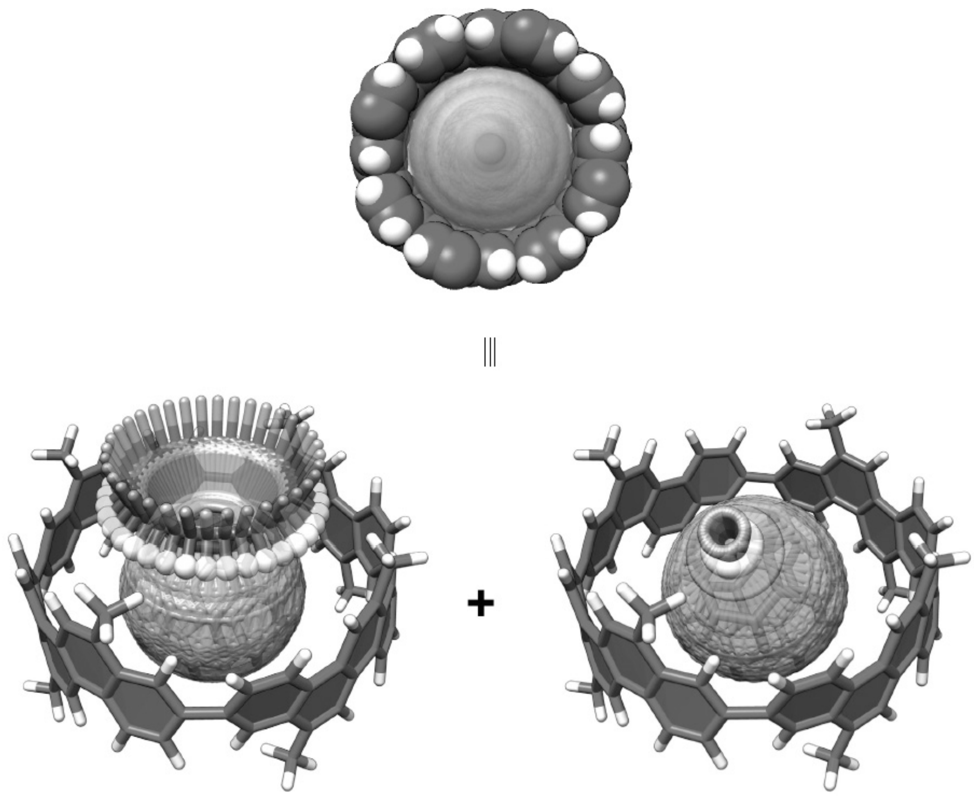
A nanometer-sized space surrounded by smoothly curved, concave surfaces of sp^2-carbon networks is an intriguing space to explore uniqueness of nanospace. The inner space of carbon nanotubes has thus attracted much attention of scientists in various fields. However, because carbon nanotubes are composed of a complex structural mixture, in-depth understanding of the nanospace has been hampered. Chemists can handle them as "chemical species" but not as "a molecular entity". We recently synthesized a series of hydrocarbon molecules that possess "persistent tubular walls" of sp^2-carbon networks. Exploring the synthesis and properties of our "finite carbon nanotube molecules", we found anomalous behaviors of molecules in the tubular nanospace. In the presentation, nanoscience of "molecular bearing (Figure)" disclosed with a chemistry language will be discussed.



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- **Educational Background**

1977 B.Sc., Shinshu University
1979 M.Sc., Graduate School of Science, Kyoto University
1983 Doctor of Science, Graduate School of Science, Kyoto University

- **Professional Career**

1979 Assistant Professor, Institute for Molecular Science
1988 Associate Professor, Mie University
1993 Professor, Nagoya University

- **Research Interests**

Nanoscience & nanotechnology of carbon nanomaterials and two-dimensional atomic layers

- **Awards**

2010 The Chemical Society of Japan Award
2011 Chunichi Cultural Award
2012 Japan Society of Applied Physics Outstanding Paper Award

- **Recent Publications**

1. "Core-Level Spectroscopy to Probe the Oxidation State of Single Europium Atoms"
L.H.G.Tizei *et al*. ***Phys.Rev.Lett.*** 114, 197602-1-5 (2015).
2. "Selective Formation of Zigzag Edges in Graphene Cracks"
M.Fujihara *et al*. ***ACS Nano*** 9, 9027-9033 (2015).
3. "Fablication and Optical Probing of Highly Extended, Ultrathin Graphene Nanoribbons in Carbon Nanotubes" H.E.Lim *et al*. ***ACS Nano***, 9, 5034-5040 (2015).
4. "Large Fullerene in Mass Spectra"
P.W.Dunk et al. ***Mol.Phys***. 113, 2359-2361 (2015).
5. "Ultraviolet Photoelectron Spectra of $Ce_2@C_{80}$ and $La_2@C_{80}$"
T.Miyazaki *et al*. ***Chem.Phys***. 447, 71-75 (2015).

Carbon Nanotube-Nanowires

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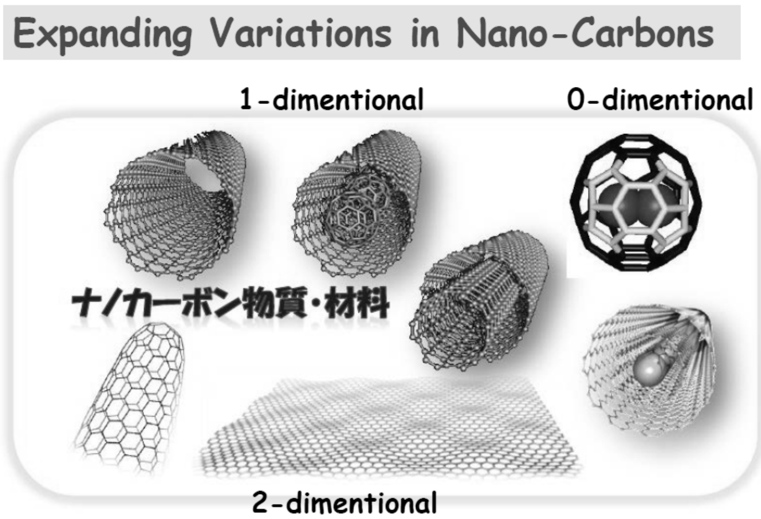
Putting atoms, molecules, and, even, nanowires of various kind into carbon nanotubes (CNT) is one of the most fascinating and exciting research topics in carbon nano-science and nanotechnology. By doing this, one can easily and drastically alter the electronic structures, electron transport and magnetic properties of CNTs, in which charge transfers between encapsulates and CNTs may oftentimes play crucial roles. In some cases, novel nanowires can be fabricated within carbon nanotubes which are not possible to produce in ambient conditions.

Here, I will discuss some novel structures, electronic and magnetic properties of nanowire-encapsulating carbon nanotubes. These include metal-nanowires,[1,2,5] graphene nanoribbons[3,4] and diamond nanowires.[6] The carbon nanotubes encapsulating, for example, Eu-nanowires exhibit anomalous magnetic properties in low temperatures as compared with the solid Eu. We found that the internal space of CNTs may also facilitate to provide even diamond nanowires from the so-called (various) diamondoids.



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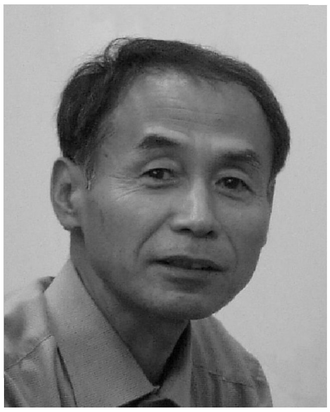
2. R.Nakanishi et al. ***Phys.Rev.B***, 86, 115445 (2012).
3. H.E.Lim *et al*. ***Nature Commun***. 4, 2548-1-7 (2013).
4. H.E.Lim *et al*. ***ACS Nano***, 9, 5034-5040 (2015).
5. L.H.G.Tizei *et al*. ***Phys.Rev.Lett.*** 114, 197602-1-5 (2015).
6. Y.Nakanishi *et al*. ***Angew.Chem.Int.Ed***. 54, 10802-10806 (2015).

Naotoshi Nakashima



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➢ Educational Background

1975 B.Sc., Kyushu University (supervisor: Prof. Toyoki Kunitake)
1977 M.Sc., Graduate School of Engineering, Kyushu University (supervisor: Prof. Toyoki Kunitake)
1980 Doctor of Engineering, Graduate School of Engineering, Kyushu University (supervisor: Prof. Toyoki Kunitake)

➢ Professional Career

1980 Assistant Professor, Kyushu University
1982 Assistant Professor, Kyushu University
1987 Associate Professor, Nagasaki University
1992 Professor, Nagasaki University
2004 Professor, Kyushu University

➢ Research Interests

1) Fundamental and applications of carbon nanotubes based on soluble nanotubes

➢ Awards

1986 The CSJ Award for Young Chemists in 1986
2000 The Award of the Society of Polymer Science, Japan
2007 Thomson Scientific Research Front Award

➢ Recent Publications

1. "Facile Isolation of Adsorbent-Free Long and Highly-Pure Chirality-Selected Semiconducting Single-Walled Carbon Nanotubes Using A Hydrogen-bonding Supramolecular Polymer", T. Toshimitsu, N. Nakashima, *Scientific Reports*, **2015**, 5, art. no.18066.
2. "A highly durable fuel cell electrocatalyst based on double-polymer-coated carbon nanotubes", M. R. Berber, I. H. Hafez, T. Fujigaya, N. Nakashima, *Scientific Reports,* **2015**, 5, art no. 16711.
3. "A simple preparation of very high methanol tolerant cathode electrocatalyst for direct methanol fuel cell based on polymer-coated carbon nanotube/platinum", Z. Yang, N. Nakashima, *Scientific Reports,* **2015**, *5,* article no. 12236.
4. "Enhancement in CO-tolerance of a Polymer-coated Pt Electrocatalyst Supported on Carbon Black-Comparison between Vulcan and Ketjenblack", Z. Yang, C. Kim, S. Hirata, T. Fujigaya, N. Nakashima, *ACS Applied Materials & Interfaces*, **2015**, *7*, 9800-9806.
5. "A phosphoric acid-doped electrocatalyst supported on poly(para-pyridine benzimidazole)- wrapped carbon nanotubes shows a high durability and performance", Z. Yang, T. Fujigaya, N. Nakashima, *J. Mater. Chem. A*, **2015**, *3*, 14318-14323.
6. "Hybrids of Copolymers of Fluorene and C60-carrying- carbazole with Semiconducting Single-Walled Carbon Nanotubes", F. Toshimitsu, N. Nakashima, *Chem. Eur. J.*, **2015**, *21*, 3359-3366.

Design and Creation of Carbon Nanotube-based Next-Generation Nanomaterials

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Single-walled carbon nanotubes (SWNTs) contain both semiconducting- and metallic-nanotubes. Highly-pure semiconducting SWNTs (sem-SWNTs) are essential for the next generation of electronic devices. In an effort to develop a removable polymer with high semiconducting-SWNT-selectivity, we have designed and synthesized a family of supramolecular polymers based on metal-ligand coordination[1] as well as hydrogen-bonding.[2] The building-blocks consist of fluorene moieties to achieve chiral selectivity and they are linked via reversible bonding. The purity of the obtained semiconducting-SWNTs was up to 99% in the Raman spectroscopy and the polymers were easily removed by adding external stimuli, such as acid treatment or changing solvents. The X-ray photoelectron spectroscopy revealed that the resulting semiconducting-SWNTs were free from the used solubilizer. The study opens a new stage for the use of such highly pure sem-SWNTs in many possible applications.

We have developed a highly durable fuel cell electrocatalyst based on double-polymer-coated carbon nanotubes for use in polymer electrolyte membrane fuel cells.[3] The prepared FC catalyst is composed of Pt-deposited polybenzimidazole-coated carbon nanotubes, which are further coated with Nafion. We fabricated MEA using the catalyst and examined the FC performance. By using this electrocatalyst, a high FC performance with a power density of 375 mW/cm^2 (at 70˚C, 50% relative humidity using air (cathode)/H_2(anode)) was obtained, and a remarkable durability of 500,000 accelerated potential cycles was recorded with only a 5%-loss of the initial FC potential and 20%-loss of the maximum power density, which were far superior properties compared to those of the MEAs prepared using carbon black in place of the carbon nanotubes. The present study indicates that the prepared highly durable fuel cell electrocatalyst is a promising material for the next generation of PEMFCs.

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1. F. Toshimitsu, N. Nakashima, *Nature Communications*, **2014**, *5*, art no. 5041.
2. F. Toshimitsu, N. Nakashima, *Scientific Reports*, **2015**, 5, art. no.18066.
3. M. R. Berber, I. H. Hafez, T. Fujigaya, N. Nakashima, *Scientific Reports,* **2015**, 5, art no. 16711.

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➢ Educational Background

1990 AB, Harvard University (advisor: Prof. Joseph J. Grabowski)
1994 Ph.D., University of California, Los Angeles (advisor: Prof. François Diederich)

➢ Professional Career

1994 National Science Foundation Postdoctoral Fellow, Michigan State University
1996 Research Corporation Postdoctoral Fellow, University of Michigan
1997 Research Assistant Professor, Stony Brook University
1999 Assistant Professor, Stony Brook University
2005 Associate Professor, Stony Brook University
2014 Associate Provost and Associate Dean of the Graduate School, Stony Brook University
2015 Professor, Stony Brook University

➢ Research Interests

1) Conjugated organic molecules and polymers with unusual structures and properties for optical and electronic applications. 2) Polyynes and other carbon-rich molecules. 3) Belt-shaped aromatic hydrocarbons. 4) All-carbon molecules and polymers.

➢ Awards

2000 NSF Career Award
2003 Journal Award, *Synlett/Synthesis,* Thieme Verlaag
2013 ACS Award for Creative Research and Applications of Iodine Chemistry

➢ Recent Publications

1. "Poly(dibromodiacetylene): Synthesis of an ordered conjugated polymer from an explosive monomer", H. Jin, C. Young, G. Halada, B. L. Phillips, and N. S. Goroff. *Angew. Chem. Int. Ed.* **2015***, 54*, 14690.
2. "The mechanism and scope of base-induced dehalogenation of (*E*)-diiodoalkenes D. Resch, C. H. Lee, S. Y. Tan, L. Luo, N. S. Goroff, *E. J. Org. Chem.* **2015**, 730.
3. "Halogen bonding of (iodoethynyl)benzene derivatives in solution", O. Dumele, D. Wu, N. Trapp, N. Goroff, F. Diederich, *Org. Lett.* **2014**, *16*, 4722.
4. "Pressure induced topochemical polymerization of diiodobutadiyne: a single-crystal-to-single-crystal transformation", H. Jin, A. M. Plonka, J. B. Parise, N. S. Goroff, *Cryst. Eng. Commun.* **2013**, *15*, 3106.
5. "An iterative method for the synthesis of symmetric polyynes", R. C. DiCicco, A. Black, L. Li, N. S. Goroff, *Eur. J. Org. Chem.*, **2012**, 4699.
6. "Room-temperature carbonization of poly(diiododiacetylene) by reaction with Lewis bases", L. Luo, D. Resch, C. Wilhelm, C. Young, G. Halada, R. Gambino, C. P. Grey, N. S. Goroff. *J. Am. Chem. Soc.* **2011**, *133*, 19274.

Dihalopolyynes: Building Carbon Materials from the Bottom Up

Nancy S. Goroff

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Dihalopolyynes can be used as precursors to many different carbon-rich skeletons, including cumulenes, longer polyyne rods, and conjugated polymers. The polarization and polarizability of the carbon-iodine or carbon-bromine bond play key roles in the diverse chemistry of these compounds. The Lewis acidity of unsaturated carbon-iodine and carbon-bromine compounds provides a handle for controlled assembly via halogen bonding, allowing for the synthesis of ordered polymers such as poly(diiododiacetylene), PIDA, poly(dibromodiacetylene), PBDA, and poly(iodoethynliododiacetylene), PIEDA.

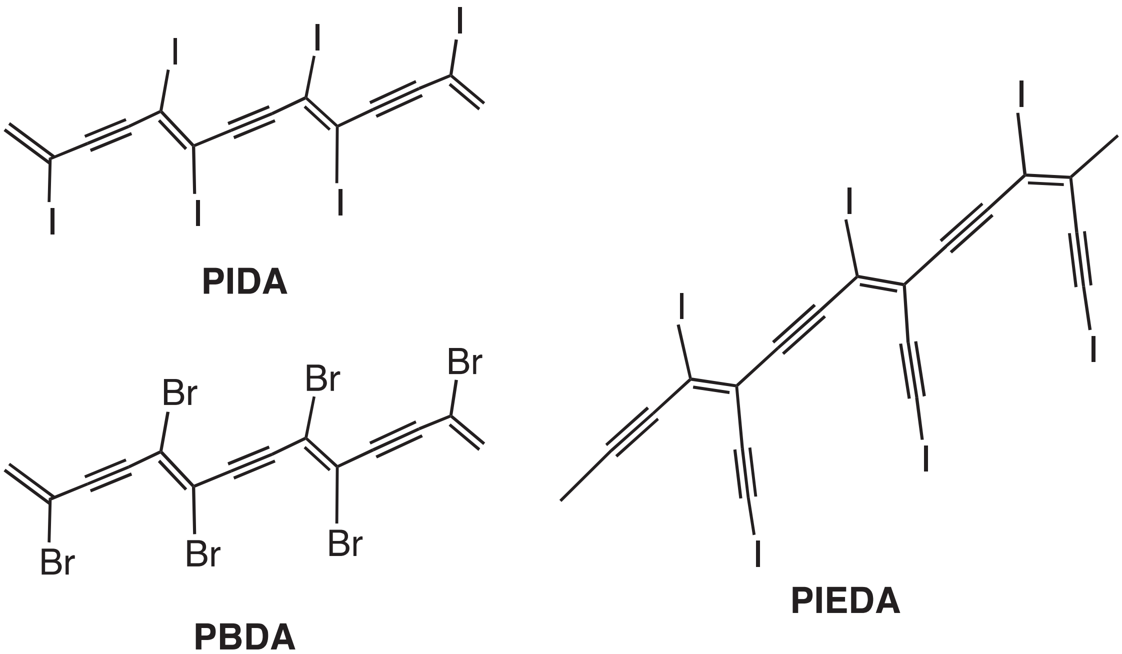

Figure 1. Conjugated polymers PIDA, PBDA, and PIEDA can be prepared from dihalopolyynes by ordered assembly and solid-state polymerization.

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➢ Educational Background

1994 B.S., Kyoto University (Supervisor: Prof. Hisanobu Ogoshi)
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1998 Ph.D., Kyoto University (Supervisor: Prof. Yoshihiko Ito)

➢ Professional Career

1998 Assistant Professor, Kyoto University
2005 Associate Professor, Nagoya University
2008 Full Professor, Nagoya University
2012 Director and Principal Investigator, ITbM, Nagoya University
2013 Research Director, JST-ERATO Itami Molecular Nanocarbon Project

➢ Research Interests

Synthetic chemistry; molecular catalysis; molecular nanocarbons; chemical plant biology; chemical chronobiology

➢ Awards

The Chemical Society of Japan Award for Distinguished Young Chemists (2005), Mitsui Chemicals Catalysis Science Award of Encouragement (2005), The MEXT Minister's Award for Distinguished Young Scientists (2006), Merck-Banyu Lectureship Award (2008), Nozoe Memorial Award for Young Organic Chemists (2011), Novartis-MIT Lectureship Award (2012), German Innovation Award (2012), Fellow of the Royal Society of Chemistry, UK (2012), Mukaiyama Award (2013), Novartis Chemistry Lectureship Award (2013), The JSPS Prize (2014), The Aldrich Lectureship Award, Emory University (2014), Nankai University Lectureship Award (2014), Swiss Chemical Society Lectureship Award (2015), Arthur C. Cope Scholar Award, American Chemical Society (2015), R. C. Fuson Visiting Professor, University of Illinois at Urbana-Champaign (2015), Ta-Shue Chou Lectureship Award, Academia Sinica (2016)

➢ Recent Publications

1. H. Omachi *et al.* ***Nature Chem.*** 5, 572 (2013).
2. K. Kawasumi *et al.* ***Nature Chem.*** 5, 739 (2013).
3. S. Suzuki *et al.* ***Nature Chem.*** 7, 227 (2015).
4. K. Ozaki *et al.* ***Nature Commun.*** 6, 6251 (2015).
5. K. Muto *et al.* ***Nature Commun.*** 6, 7508 (2015).
6. N. Kubota *et al.* ***J. Am. Chem. Soc.*** 137, 1356 (2015).
7. H. Ueno *et al.* ***Angew. Chem. Int. Ed.*** 54, 3707 (2015).
8. T. Fujikawa *et al.* ***J. Am. Chem. Soc.*** 137, 7763 (2015).
9. T. Kuwabara *et al.* ***Angew. Chem. Int. Ed.*** 54, 9646 (2015).
10. Y. Segawa *et al.* ***Nature Rev. Mater.*** 1, 15002 (2016).

Single-molecule Carbon Nanotubes, Nanoribbons, and a New Form of Carbon

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[b] *Graduate School of Science, Nagoya University.*
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Nanometre-sized carbon materials consisting of benzene units oriented in unique geometric patterns, hereafter named nanocarbons, conduct electricity, absorb and emit light, and exhibit interesting magnetic properties. Spherical fullerene C_{60}, cylindrical carbon nanotubes and sheet-like graphenes are representative forms of nanocarbons, and theoretical simulations have predicted a number of exotic three-dimensional nanocarbon structures. At present, however, synthetic routes to nanocarbons mainly lead to mixtures of molecules with a range of different structures and properties, which cannot be easily separated or refined into pure forms. Some researchers believe it is impossible to synthesise these materials in a precise manner. Obtaining “pure” nanocarbons is a great challenge in the field of nanocarbon science, and the construction of structurally uniform nanocarbons –ideally as single molecules– is crucial for the development of functional materials in nanotechnology, electronics, optics, and biomedical applications.

In this talk, our organic chemistry approach will be presented. I will describe a “growth from template” approach for the synthesis of 1D carbon nanotubes and 2D nanographenes from small organic molecules. The creation of 3D warped nanocarbons will be also discussed.

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Educational Background

1973 B.Sc., Tokyo Institute of Technology
1998 Ph.D., Tokyo Institute of Technology

Professional Career

1995- Professor of Chemistry, University of Tokyo; Elected Fellow of the American Association for the Advancement of Science (1998), Elected Foreign Fellow of the Royal Society of Chemistry (U. K., 2005), Honorary Foreign Member of the American Academy of Arts and Sciences (2008), Honorary Member of the Israel Chemical Society (2009), The Arthur C. Cope Scholar Award of ACS (2010), Journal of the American Chemical Society (2009-)

Research Interests

Organic chemistry, nanoscience, molecular electronics

Awards

2003 The Chemical Society of Japan Award
2006Humboldt Research Award
2009 The Medal of Honor with Purple Ribbon
2010 The Arthur C. Cope Scholar Award of ACS
2014 The 55th Fujiwara Award, Centenary Prize 2014, Royal Society of Chemistry

Recent Publications

1. Chemical Pathways Connecting Lead(II) Iodide and Perovskite via Polymeric Plumbate(II) Fiber, Y. Guo, K. Shoyama, W. Sato, Y. Matsuo, K. Inoue, K. Harano, C. Liu, H. Tanaka, E. Nakamura, *J. Am. Chem. Soc.*, **137**, 15907-15914 (2015).
2. Iron-Catalyzed Directed Alkylation of Aromatic and Olefinic Carboxamides with Primary and Secondary Alkyl Tosylates, Mesylates, and Halides, L. Ilies, T. Matsubara, S. Ichikawa, S. Asako, E. Nakamura, *J. Am. Chem. Soc.*, 136, 13126-13129 (2014).
3. Heterogeneous Nucleation of Organic Crystals Mediated by Single-Molecule Templates, K. Harano, T. Homma, Y. Niimi, M. Koshino, K. Suenaga, L. Leibler, E. Nakamura, *Nat. Mater*., 11, 877-881 (2012).
4. Columnar Structure in Bulk Heterojunction in Solution-Processable Three-Layered p-i-n Organic Photovoltaic Devices Using Tetrabenzoporphyrin Precursor and Silylmethyl[60]fullerene, Y. Matsuo, Y. Sato, T. Niinomi, I. Soga, H. Tanaka, E. Nakamura, *J. Am. Chem. Soc.*, 131, 16048-16050 (2009).

Chemistry at Nano and Mesoscopic Interfaces

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"Molecular design does not produce the designed function." This happens all the time in chemistry, either in industry or in academy, in particular, in the design and fabrication of nano-devices. This problem originates from the lack of our understanding of the regime between the molecular world and the real world, that is, the lack of our knowledge on the behavior of molecular clusters at the boundary between quantum mechanical world and classical mechanical world. Studying a single molecule is not enough to predict its function, because the molecular function is the property of molecular ensembles rather than a single molecule. This lecture will discuss some of the issues related to this regime.

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K. Harano, T. Homma, Y. Niimi, M. Koshino, K. Suenaga, L. Leibler, E. Nakamura, *Nat. Mater.*, **11**, 877-881 (2012).

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➢ Educational Background

1974 B.S. University of Oklahoma, USA
1980 Ph.D. University of Texas at Austin, USA (supervisor: Prof. Michael J. S. Dewar)
1980-1983 Postdoctoral Fellow. Purdue University, USA (supervisor: Prof. Herbert C. Brown)

➢ Professional Career and Selected Positions

1983-present Assistant Professor to Professor, University of Oklahoma, USA
1989-1990 Provost's Faculty Administrative Fellow
2003-2004 Visiting Professor at MIT, Ford Foundation Fellow, Guggenheim Fellow
2005 AAAS Fellow
2007 Visiting Professor at Rice University
2007-2008 Fulbright Fellow at University of Bulgaria, Sofia
2008 Chancellor's Diversity Scholar at UC San Diego
2010 ACS Fellow
2010-2011 Visiting Professor at University of Texas at Austin, MLK Fellow at MIT
2010-2012 Visiting Professor at MIT
2016 President, American Chemical Society

➢ Research Interests

1) Single-Walled Carbon Nanotube (SWCNT) Reactions. 2) Reactions of Alkenes. 3) Organic Chemistry Education. 4) Demographics of Research University STEM Faculty. 5) Public Perception of Science and Scientists.

➢ Selected Awards

2004 NOW Woman of Courage National Award
2006-2010 NSF ADVANCE Leadership Award
2011 ACS E. Ann Nalley Volunteerism Award
2011 ACS Stan Israel Award for Diversifying the Chemical Sciences
2012 Oklahoma Chemist Award

➢ Recent Publications

1. Comparing Carbonyl Chemistry Across Undergraduate Organic Chemistry Textbooks. Donna J. Nelson, Ravi Kumar, and Saravananan Ramasamy. *J. Chem. Ed.* **2015**, *92*, 1171-1177.
2. Nadia Whitehead, Donna Nelson. What was it like to consult for Breaking Bad? *Science/AAAS*. **2014**, May 2. http://news.sciencemag.org/chemistry/2014/05/what-was-it-consult-breaking-bad
3. Ionomer Covalent Functionalization of Single-Walled Carbon Nanotubes by Radical Polymerization of Zirconium Acrylate. Sellamuthu N. Jaisankar, Donna J. Nelson, Ravi Kumar, and Asit Baran Mandal. *AIChE Journal.* **2014**, *60*, 820.
4. Hollywood Chemistry: When science met entertainment. Nelson, Donna J.**;** Grazier, K. R.; Paglia, J.; Perkowitz, S. American Chemical Society. Vol 1139, 2013. http://pubs.acs.org/isbn/9780841228245 3Sep2013.
5. Characterizing Covalently Sidewall-Functionalized SWCNTs by using ^{1}H NMR Spectroscopy. Donna J. Nelson and Ravi Kumar. *J. Phys. Chem. C* **2013**, *117(28)*, 14812-14823.
6. Effect of Single-Walled Carbon Nanotube Association upon ^{1}H NMR Spectra of Amines." Donna J. Nelson and Ravi Kumar. *J. Phys. Chem. C* **2013**, *117*, 3160-3168.
7. Nelson Diversity Surveys. Donna J. Nelson. *Wikipedia, The Free Encyclopedia*. Date retrieved: 17 January 2016 05:23 UTC. https://en.wikipedia.org/wiki/Nelson_Diversity_Surveys

Functionalization and Characterization of Single-Walled Carbon Nanotubes by using NMR

Donna J. Nelson

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NMR spectra of free organic compounds are compared against those which are complexed to SWCNTs. Some signals for protons are observed to shift downfield. The degree to which different protons are shifted downfield indicates the closeness of those protons to the point(s) of complexation in the organic compounds. Data for a variety of different classes of organic compounds will be presented and analyzed.

Nanocarbons

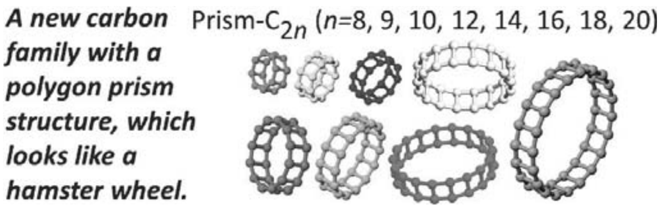
Prism Carbons; GRRM Strategy | OPEN *Editor's Choice*

doi:10.1246/cl.150120

K. Ohno

A Prism Carbon Molecule C_{20}

Koichi Ohno,* Hiroko Satoh, and
Takeaki Iwamoto
Chem. Lett. **2015**, *44*, 712-714



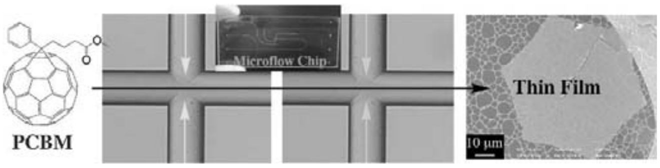
Fullerene Microsheets; Microfluidic Techniques | OPEN *Editor's Choice*

doi:10.1246/cl.141186

M. Numata

Synchronized Self-assembly of a Fullerene Derivative Passing through a Programmable Microflow Field

Munenori Numata,* Tomohiro Kozawa,
Takuya Nakadozono, Yusuke Sanada, and
Kazuo Sakurai
Chem. Lett. **2015**, *44*, 577-579



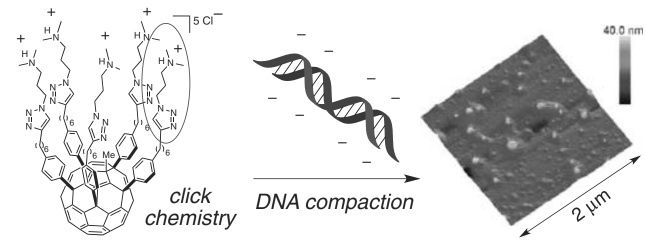
DNA-binding Fullerene; Click Chemistry | OPEN *Editor's Choice*

doi:10.1246/cl.141092

E. Nakamura

DNA Binding of Pentaamino[60]fullerene Synthesized Using Click Chemistry

Hirohisa Nitta, Kosuke Minami,
Koji Harano,* and Eiichi Nakamura*
Chem. Lett. **2015**, *44*, 378-380



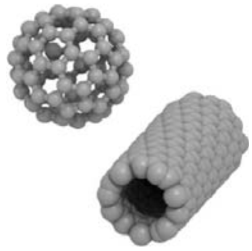
Metallofullerenes; Carbon Nanotubes | OPEN *Award Accounts*

doi:10.1246/bcsj.20140295

T. Akasaka

Emergence of Highly Elaborated π-Space and Extending Its Functionality Based on Nanocarbons: New Vistas in the Fullerene World

Michio Yamada and Takeshi Akasaka*
Bull. Chem. Soc. Jpn. **2014**, *87*, 1289-1314



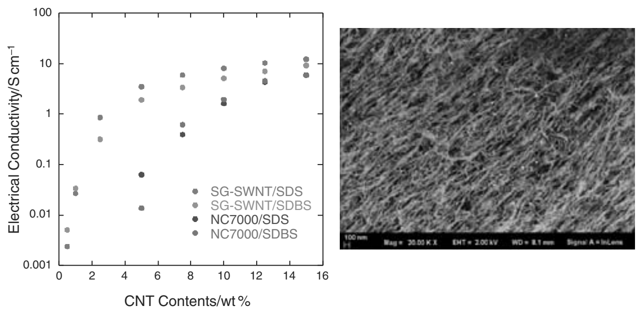
SWNT/Latex Polymer Composites; Electroconductivity | *Selected Paper*

doi:10.1246/bcsj.20140248

N. Nakashima

Latex Polymer/Super Growth-Single-Walled Carbon Nanotube Composites with High Electroconductivity Fabricated by Wet Processing

Masahiro Shigeta, Tomoko Endo, Yui Kondo,
Mitsugu Uejima, Susumu Okada,
Kenji Kaneko, and Naotoshi Nakashima*
Bull. Chem. Soc. Jpn. **2014**, *87*, 1343-1348



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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 **H** hydrogen [1.007; 1.009]																	2 **He** helium 4.003
3 **Li** lithium [6.938; 6.997]	4 **Be** beryllium 9.012											5 **B** boron [10.80; 10.83]	6 **C** carbon [12.00; 12.02]	7 **N** nitrogen [14.00; 14.01]	8 **O** oxygen [15.99; 16.00]	9 **F** fluorine 19.00	10 **Ne** neon 20.18
11 **Na** sodium 22.99	12 **Mg** magnesium [24.304; 24.307]											13 **Al** aluminium 26.98	14 **Si** silicon [28.08; 28.09]	15 **P** phosphorus 30.97	16 **S** sulfur [32.05; 32.08]	17 **Cl** chlorine [35.44; 35.46]	18 **Ar** argon 39.95
19 **K** potassium 39.10	20 **Ca** calcium 40.08	21 **Sc** scandium 44.96	22 **Ti** titanium 47.87	23 **V** vanadium 50.94	24 **Cr** chromium 52.00	25 **Mn** manganese 54.94	26 **Fe** iron 55.85	27 **Co** cobalt 58.93	28 **Ni** nickel 58.69	29 **Cu** copper 63.55	30 **Zn** zinc 65.38	31 **Ga** gallium 69.72	32 **Ge** germanium 72.63	33 **As** arsenic 74.92	34 **Se** selenium 78.96	35 **Br** bromine [79.901; 79.907]	36 **Kr** krypton 83.80
37 **Rb** rubidium 85.47	38 **Sr** strontium 87.62	39 **Y** yttrium 88.91	40 **Zr** zirconium 91.22	41 **Nb** niobium 92.91	42 **Mo** molybdenum 95.96	43 **Tc** technetium	44 **Ru** ruthenium 101.1	45 **Rh** rhodium 102.9	46 **Pd** palladium 106.4	47 **Ag** silver 107.9	48 **Cd** cadmium 112.4	49 **In** indium 114.8	50 **Sn** tin 118.7	51 **Sb** antimony 121.8	52 **Te** tellurium 127.6	53 **I** iodine 126.9	54 **Xe** xenon 131.3
55 **Cs** caesium 132.9	56 **Ba** barium 137.3	57-71 lanthanoids	72 **Hf** hafnium 178.5	73 **Ta** tantalum 180.9	74 **W** tungsten 183.8	75 **Re** rhenium 186.2	76 **Os** osmium 190.2	77 **Ir** iridium 192.2	78 **Pt** platinum 195.1	79 **Au** gold 197.0	80 **Hg** mercury 200.6	81 **Tl** thallium [204.3; 204.4]	82 **Pb** lead 207.2	83 **Bi** bismuth 209.0	84 **Po** polonium	85 **At** astatine	86 **Rn** radon
87 **Fr** francium	88 **Ra** radium	89-103 actinoids	104 **Rf** rutherfordium	105 **Db** dubnium	106 **Sg** seaborgium	107 **Bh** bohrium	108 **Hs** hassium	109 **Mt** meitnerium	110 **Ds** darmstadtium	111 **Rg** roentgenium	112 **Cn** copernicium		114 **Fl** flerovium		116 **Lv** livermorium		
		57 **La** lanthanum 138.9	58 **Ce** cerium 140.1	59 **Pr** praseodymium 140.9	60 **Nd** neodymium 144.2	61 **Pm** promethium	62 **Sm** samarium 150.4	63 **Eu** europium 152.0	64 **Gd** gadolinium 157.3	65 **Tb** terbium 158.9	66 **Dy** dysprosium 162.5	67 **Ho** holmium 164.9	68 **Er** erbium 167.3	69 **Tm** thulium 168.9	70 **Yb** ytterbium 173.1	71 **Lu** lutetium 175.0	
		89 **Ac** actinium	90 **Th** thorium 232.0	91 **Pa** protactinium 231.0	92 **U** uranium 238.0	93 **Np** neptunium	94 **Pu** plutonium	95 **Am** americium	96 **Cm** curium	97 **Bk** berkelium	98 **Cf** californium	99 **Es** einsteinium	100 **Fm** fermium	101 **Md** mendelevium	102 **No** nobelium	103 **Lr** lawrencium	

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Atomic weights from IUPAC PAC-REP-13-03-02

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