SYNTHETIC CHEMISTRY-THE GATEWAY TO NANOSCIENCE-

Eiichi Nakamura
Department of Chemistry, The University of Tokyo, Bunkyo-ku, Tokyo 113-0033, Japan
E-mail: E-mail: nakamura@chem.s.u-tokyo.ac.jp
http://www.chem.s.u-tokyo.ac.jp/

Carbon clusters remain to be the subject of 2000 papers every year. While a majority of these reports are concerned with intact molecules, it is our belief that the future science of carbon clusters depends on chemically modified carbon cluster complexes and control of their nano architectures-a new challenge for synthetic chemists.

Some time ago, we discovered that addition of an organocopper reagent to [60]fullerene takes place regioselectiviely to give penta-addition product.[1] The reaction is completely regioselective, often quantitative and can be carried out on a multi-gram scale with minimum synthetic skill. The adduct can be converted to a variety of metal complexes, where the fullerene cyclopentadienide (FCp) serves as a h^5-ligand to the metal, an intriguing example being "bucky ferrocene".[2] We now found that metal atoms can be introduced also in a "ship-in-bottle" way into carbon nanotubes to make endohedral metallonanotubes.[3] Such engineered carbon clusters can then be transformed into one- or two-dimensional nano-architectures.[4]

References:

[1] M. Sawamura, H. Iikura, and E. Nakamura, *J. Am. Chem. Soc.,* **118** (1996) 12850-12851.
[2] A. Hashimoto, H. Yorimitsu, K. Ajima, K. Suenaga, H. Isobe, J. Miyawaki, M. Yudasaka, S. Iijima, E. Nakamura, *Proc. Natl. Acad. Sci*, in press.
[3] M. Sawamura, Y. Kuninobu, M. Toganoh, Y. Matsuo, M. Yamanaka and E. Nakamura, *J. Am. Chem. Soc*., **124** (2002) 9354-9355.
[4] S. Zhou, C. Burger, B. Chu, M. Sawamura, N. Nagahama, M. Toganoh, U. E. Hackler, H. Isobe, and E. Nakamura, *Science*, **291**, (2001) 1944-1947; M. Sawamura, K. Kawai, Y. Matsuo, K. Kanie, T. Kato and E. Nakamura, *Nature*, **419**, (2002) 702-705; E. Nakamura and H. Isobe *Acc. Chem. Res.* **36**, (2003) 807-815.