Structure Sorting of Single-Wall Carbon Nanotubes using Gel Column Chromatography

Hiromichi Kataura[*,1,2], Huaping Liu[1,2], Yasuhiro Ito[1,2], Maki Shimizu[1,2], Yasuko Urabe[1,2], Atsushi Hirano[1,2], Shunjiro Fujii[1,2], and Takeshi Tanaka[1]

[1]*Nanosystem Research Institute, National Institute of Advanced Industrial Science and Technology (AIST), C4, Higashi 1-1-1, Tsukuba, Ibaraki 305-8562, Japan*
[2]*CREST, JST, Kawaguchi 330-0012, Japan*

Mixed production of different structures of single-wall carbon nanotubes (SWCNTs) is one of the most serious problems for their potential applications to high-speed electronic devices. Density gradient ultracentrifugation (DGU) method first realized high-purity metal/semiconductor (M/S) separation [1], but the cost of separation is too high for the industrial applications. In AIST, we have developed new methods of M/S separation using agarose gel, which are much more cost effective methods than the DGU [2-4]. Kappes group showed that Sephacryl gel (GE Healthcare) can also be used for M/S separation as well as agarose gel [5]. We found that the interaction between Sephacryl gel and SWCNTs is chirality dependent. We have successfully realized single-chirality separation of SWCNTs [6]. Now we improved the separation method. In this presentation, we will show the latest results on the one-step single chirality separation using a temperature controlled gel column chromatography method.

References

[1] M.S. Arnold et al, Nat. Nanotechnol. **1** (2006) 60.
[2] T. Tanaka et al., Appl. Phys. Express **1** (2008) pp. 114001.
[3] T. Tanaka et al., Nano Lett. **9** (2009) 1497.
[4] T. Tanaka et al., Appl. Phys. Express, **2** (2009) 125002.
[5] K. Moshammer et al., Nano Res. **2** (2009) 599.
[6] H. Liu et al. Nat. Commun., **2** (2011) 309.