P9 A single step route to highly concentrated nanotube solutions

Adam J. Clancy[1], Takuya Morishita[1,2], Milo S. P. Shaffer[1,*]

*1 Department of Chemistry, Imperial College London, UK (*m.shaffer@imperial.ac.uk)*
2 Toyota Central R&D Labs. Inc., Japan

A one-step reduction and dissolution of single-walled carbon nanotubes (SWNTs) is demonstrated, giving rise to a fast, facile and scalable route towards high concentrations (>5 mg ml^{-1}) of anionic individualized nanotubes (nanotubide). The reactivity of these solutions with organohalides is quantified with regards to concentrations of reducing metal and SWNT, as well as metal carbon ratio, sterics of the grafted group and choice of halogen.

Reduction of SWNTs to nanotubide is the only known route to truly individualized nanotubes that does not require damaging sonication or unscalable ultracentrifugation [1] while simultaneously providing a route towards functionalization. [2] Simplifying nanotubide production and probing the subsequent reactions will facilitate advancements in a wide array of SWNT applications, particularly in high performance composites.

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P10 Precursor-dependent reversible diameter modulation of vertically aligned single-walled carbon nanotubes

Erik Einarsson[1], Theerapol Thurakitseree[1], Akihito Kumamoto[1], Christian Kramberger[2], Shohei Chiashi[1], Yuichi Ikuhara[1], Shigeo Maruyama[1,*]

*1 The University of Tokyo, Japan (*maruyama@photon.t.u-tokyo.ac.jp)*
2 University of Vienna, Austria

We synthesized vertically aligned single-walled carbon nanotubes (SWNTs) with a mean diameter of approximately 1 nm by chemical vapor deposition (CVD) of an acetonitrile-ethanol mixture [1]. The addition of no more than five volume percent acetonitrile in ethanol results in a dramatic reduction of the mean SWNT diameter. In the absence of acetonitrile, the mean diameter returns to the ~2 nm typical of ethanol-grown vertically aligned SWNTs. We also show the diameter can be modulated on the fly by the addition or absence of acetonitrile in the feedstock, and this diameter change is both reversible and repeatable [2].

We examined the interface between small- and large-diameter SWNTs by scanning electron microscopy (SEM) and high-resolution transmission electron microscopy (HR-TEM). Layers having different diameter can be separated from one another, but the separation is not always clear-cut. Further examination by HR-TEM revealed some of the SWNT junctions are actually continuous, whereas most are discontinuous across the interface [2]. Based on these findings, we propose that acetonitrile changes the growth mode from tangential to perpendicular [3], causing a marked reduction in SWNT diameter.

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