

Important factors in chirality-specific growth of single-walled carbon nanotubes

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Single-walled carbon nanotubes (SWNTs) present structure-determined outstanding properties and may find important applications in many fields[1]. However, the chirality-controlled growth of SWNTs has been a great challenge for many years[2]. It is shown that the tube structure can be well controlled in a templated growth process[3-5]. Carbon nanotubes[6] and their caps[4] or catalysts[5] can all act as the structural templates.

SWNT growth via a catalyzed chemical vapor deposition CVD process is normally more efficient[7]. This is also true in the chirality selective growth processes. We used W_6Co_7 nanocrystals as catalysts and realized chirality-specific growth of SWNTs by optimizing the growth conditions[5]. As a kind of intermetallic compound, W_6Co_7 nanocrystals present unique structure and property, which are distinctly different from the normal alloy nanoparticles or simple metal nanocrystals. Besides the catalysts, the CVD condition is also very important. The factors which can influence the chirality selectivity and the mechanism of the process will be discussed from the thermodynamic and kinetic points of view.

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