

Synthesis of Ultra-Long Carbon Nanotube (CNT)

Tech ID: 34179 / UC Case 2005-779-0

BRIEF DESCRIPTION

This technology introduces a fast and low-cost method suitable for manufacturing ultra-long carbon nanotubes using water-soluble catalysts and standard optical lithography. Further, it also ensures vertical alignment of electrodes, a crucial component in electronic devices.

FULL DESCRIPTION

This invention revolutionizes the synthesis of carbon nanotubes (CNTs) by introducing a novel technique that significantly extends the length of CNTs to 1.5 mm without the need for rapid heating, far surpassing previous capabilities. It also ensures vertical alignment of electrodes on CNTs. Excitingly, this method can be applied to single- as well as multi-walled CNTs. Traditionally, CNT synthesis relied on chemical vapor deposition (CVD) with patterned transition metal catalysts on substrates, where the catalyst must be removed using polar solvents. However, these polar solvents also ended up negatively influencing the vertical alignment of electrodes. By using polymethylmethacrylate (PMMA) as a patterning material and water to dissolve the transition metal catalyst, this new method simplifies the catalyst patterning process, allowing for the use of standard optical lithography tools like the Kark-Suss aligner, thus avoiding the need for costly lithography instruments such as the electron beam writer.

SUGGESTED USES

- » Electronics and semiconductors for enhanced electrical conductivity components
- » Composite materials for stronger and lighter structural materials
- » Energy storage, including batteries and supercapacitors, for improved energy capacity and efficiency
- » Sensors and actuators for high-sensitivity applications
- » Improving RF and microwave technology

ADVANTAGES

- » Significantly longer CNTs (up to 1.5 mm) compared to conventional methods
- » Reduced cost by eliminating the need for expensive instruments and processes
- » Simplified process using water-soluble catalysts and standard optical lithography
- » Increased compatibility with existing manufacturing processes
- » Ensures vertical alignment of electrodes

PATENT STATUS

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OTHER INFORMATION

CATEGORIZED AS

- » **Energy**
 - » Storage/Battery
- » **Materials & Chemicals**
 - » Composites
- » **Sensors & Instrumentation**
 - » Other

RELATED CASES

2005-779-0

Country	Type	Number	Dated	Case
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