



## Global Market for Carbon Nanotubes – Overview

Carbon nanotubes (CNT) are molecules of carbon related to two other carbon crystal forms, graphite and diamonds. Single-walled nanotubes (SWNT) average 1.2 nm in diameter and can be up to microns long. They are often described as looking like rolls of graphite chicken wire, but CNTs are actually part of the fullerene family; they are essentially buckyballs expanded from the center into cylinders.

Today, there are 16 major producers, half in the United States. This number is growing, however, and Japan, Korea, China and France have all announced industrial-scale nanotube production facilities that should be online within about two to three years.

Current commercial applications for nanotubes include conductive polymers, advanced composites, fibers and displays. Industries already utilizing these applications include automotive, aerospace, household appliances, sporting goods, telecommunications equipment, and medical. The next few years are likely to see significant growth in five major applications - conductive polymer composites, electromechanical devices, field emission devices, nanoelectronics, and sensors and probes.

Global CNT production capacity is currently over 2.5 metric tons per day. The global market for nanotubes in 2002 was approximately \$12 million. This is expected to grow exponentially over the next few years, reaching \$123 million in 2003, and perhaps \$700 million by 2005.

### Total Nanotube Market to 2005

Estimated Nanotube Sales per Segment, 2002-2005, in millions \$US				
Segment	2002	2003	2004	2005
Plastics	\$4.0	\$40.5	\$125.5	\$230
Advanced Composites	\$3.2	\$36.5	\$114	\$210
Fibers	\$2.8	\$33	\$102.5	\$190
R&D and Other	\$0.8	\$10.5	\$30	\$55
Field Emission	\$0.3	\$2.5	\$7.6	\$15
<b>Total Sales</b>	<b>\$12</b>	<b>\$123</b>	<b>\$380</b>	<b>\$700</b>

