

news

recent
research
campus
by topic
events
archives
in the news

subscribe

podcasts
e-news
tech talk
news releases
rss feeds

services

request images
submit news
promote news
media inquiries

about us

news office info
MIT background
contact



Using Nanotubes in Computer Chips

A new technique for growing carbon nanotubes should be easier to integrate with existing semiconductor manufacturing processes

September 10, 2009

Source: "Low Temperature Synthesis of Vertically Aligned Carbon Nanotubes with Electrical Contact to Metallic Substrates Enabled by Thermal Decomposition of the Carbon Feedstock," Gilbert Nessim, Carl V. Thompson et al, Nano Letters, Aug. 31, 2009

Results: Researchers in the lab of MIT materials science professor Carl V. Thompson grew dense forests of crystalline carbon nanotubes on a metal surface at temperatures close to those characteristic of computer chip manufacturing. Unlike previous attempts to do the same thing, the researchers' technique relies entirely on processes already common in the semiconductor industry. The researchers also showed that the crucial step in their procedure was to preheat the hydrocarbon gas from which the nanotubes form, before exposing the metal surface to it.

Why it matters: The transistors in computer chips are traditionally connected by tiny copper wires. But as chip circuitry shrinks and the wires become thinner, their conductivity suffers and they become more likely to fail. A simple enough manufacturing process could enable carbon nanotubes to replace the vertical wires in chips, permitting denser packing of circuits.

How they did it: In a vacuum chamber, the researchers vaporized the metals tantalum and iron, which settled in layers on a silicon wafer. Then they placed the coated wafer at one end of a quartz tube, which was inserted into a furnace. At the wafer's end of the tube, the furnace temperature was 475 degrees C; but at the opposite end, the temperature varied. The researchers pumped ethylene gas into the tube from the end opposite the wafer. When the temperature at that end approached 800 degrees, the ethylene decomposed, and the iron on the wafer catalyzed the formation of carbon nanotubes.

Next steps: The researchers are trying to determine whether different combinations of metals and hydrocarbon gases can lower the catalytic temperature even further and improve the quality of the nanotubes.

Funding: The research was sponsored by the MARCO Interconnect Focus Center and partially by Intel (Gilbert Nessim, who was a graduate student in Thompson's lab, was supported by an Intel Fellowship).

TOOLS

[Print version](#)

E-mail article: Use the form below to e-mail a link to this article.

To [e-mail address(es)]:

From (your name):

(your e-mail address):

Personal message to recipient (optional)

The MIT News Office does not store this information.

To send, click "E-mail article" below.

[E-mail article](#)

[Share](#)

[RSS feeds](#)

RELATED

[Carl V. Thompson](#)

["Low Temperature Synthesis of Vertically Aligned Carbon Nanotubes with Electrical Contact to Metallic Substrates Enabled by Thermal Decomposition of the Carbon Feedstock" - Nano Letters](#)

More: [Materials science](#)

More: [Nanoscience and nanotechnology](#)

TODAY'S NEWS

[View RSS feed](#)

