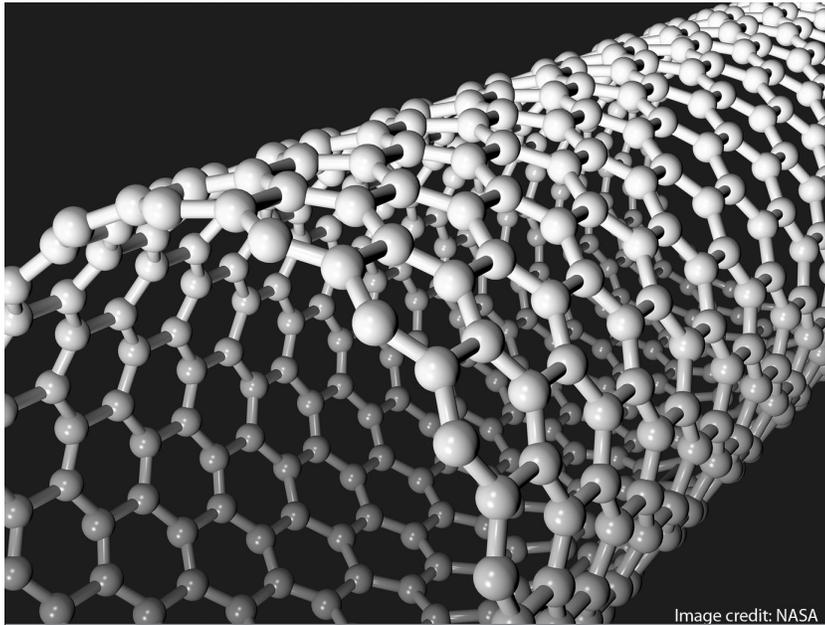




TECHNOLOGY SOLUTION

Instrumentation



Macroscopic Nanotube Fabrication Process Control

Magnetic and Raman based Method for Macroscopic Process Control during Fabrication of Carbon Nanotube based Structures

NASA's Langley Research Center has developed an innovative magnetic and Raman based method for macroscopic process control during fabrication of carbon nanotube based structures. The development of super-strong lightweight materials based upon carbon nanotubes promises new materials with the strength of current carbon composite materials, but at substantially less weight. The development of these new materials is dependent upon nanotube quality, alignment, and load transfer between individual nanotubes in the structure. However, current fabrication process controls are limited to time consuming microscopy testing at intermittent stages during processing. NASA's innovative method can be applied during nanotube structure fabrication to obtain real-time feedback on critical processing parameters during fabrication. Moreover, the method is compatible with in-line fabrication processes.

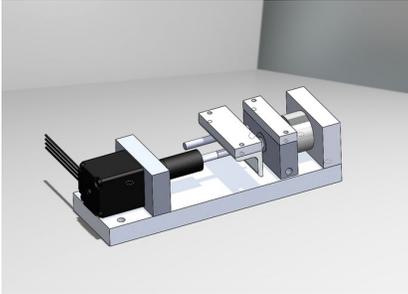
BENEFITS

- Integration of known methods to increase manufacturing quality and yield by non-destructive characterization of key technical characteristics of large-scale carbon nanotube structural materials during or shortly after the fabrication process
- New methodology promises to enable high quality, high yield of carbon nanotube-based structural materials for mission critical applications, with an approximately 30% weight reduction over carbon composite materials in applications such as pressure vessels



THE TECHNOLOGY

A combination of magnetic and optical methods are applied to characterize the residual catalyst content, nanotube alignment and load transfer between individual nanotubes during the fabrication process. The techniques used in this method, which have been proven at the micro level, are applied so that scanning and mapping occurs at the macro level. These methods have been successfully used for nondestructive evaluation of large-format carbon nanotube-based structures, primarily yarns as well as sheets from several inches square to as large as 4ft. by 8ft.



Apparatus for in-situ Raman measurements of Materials. Image credit: NASA

APPLICATIONS

The technology has several potential applications:

- Carbon Fabrication Industry

PUBLICATIONS

Patent No: 10,139,345

National Aeronautics and Space Administration

Agency Licensing Concierge

Langley Research Center

Mail Stop 020
Hampton, VA 23681
202-358-7432

Agency-Patent-Licensing@mail.nasa.gov

www.nasa.gov

NP-2015-06-1915-HQ

technology.nasa.gov

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

LAR-18557-1, LAR-TOPS-133