Nanotechnology to Replace Copper-Based Electrical Wiring

Supporting/Contributing Agency: National Reconnaissance Office

Conductive wiring research programs with Nanocomp Technologies (Concord, NH) leverage its proprietary advancements in the production of millimeter long carbon nanotubes together with a unique ability to formulate them into conductive yarns and wires. The government's R&D focuses on creating products with revolutionary performance benefits, creating a new generation of extremely lightweight and highly conductive wires.

Electrical conduction wires, co-axial cables, and signal cables contribute significantly to the easily reducible weight for unmanned aerial vehicles, commercial aircraft, and satellite and missile systems. The use of CNT shielding and conductor products also means 70% total weight savings for data cables; and, there is 33% weight savings using CNT materials just for a cables co-axial shielding alone. In addition, changes in resistivity with temperature are much less with CNT materials than with metals and this has been confirmed for both raw and doped materials from 77^{o}K to over 120^{o}C.

Additional applications that benefit from this R&D are ground planes, electromagnetic interference (EMI) suppression, lightning protection, electromagnetic (EM) shielding, and embedded wiring for personnel monitoring, communications, signature management, and heating.

Table 1. Current State of CNT Conductor R&D

Property	Current Achievement
Current Carrying	Capable of carrying more current than copper
Conduction	More conductive than copper at high frequencies

The Figures below show examples of current products that use carbon nanotube materials to replace copper in specific applications. R&D continues on property tailoring but the key need now is scale up production capability to meet market demand.

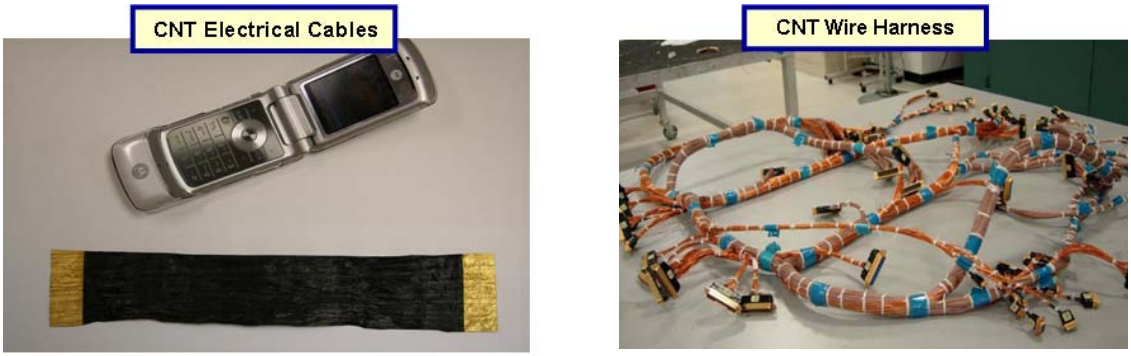

Figure 1. CNT conductive wire R&D now yields applications

References/Publications

Lashmore, D. and Antoinette, P., High Volume Production of CNT Sheets and Yarns, Burlingame, CA, 9 April 2009.