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Stiff and Multifunctional Carbon Nanotube Composites YUNTIAN ZHU, XIN WANG, North Carolina State University, QINGWEN LI, Suzhou Institute of Nanotechnology and Nanobionics, PHILIP BRADFORD, FUH-GWO YUAN, North Carolina State University, DENNIS TUCKER, NASA Marshall Space Flight Center, WEI CAI, HSIN WANG, Oak Ridge National Laboratory — It has been a challenge for two decades to assemble the extremely strong carbon nanotubes (CNTs) into macroscopic CNT composites that break the strength ceiling of carbon fiber composites. Here we report the fast incorporation of long CNTs into polymer matrix using a novel approach, stretch-winding, to produce composites that are much stronger than any current engineering composite. The CNT composites reach a strength of 3.8 GPa, an excellent electrical conductivity and a high thermal conductivity. These superior properties are primarily derived from the long length, high volume fraction, good alignment and reduced waviness of the CNTs that are produced. The combination of high strength and excellent electrical and thermal conductivities makes CNT composites a promising enabler of new aerospace technologies and adventures.

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