Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Reinforced Epoxy Nanocomposite Sheets Utilizing Large Interfacial Area from a High Surface Area Single-Walled Carbon Nanotube Scaffold KAZUFUMI KOBASHI, HIDEKAZU NISHINO, TAKEO YAMADA, DON FUTABA, MOTOO YUMURA, KENJI HATA, AIST — We employed single-walled carbon nanotubes (SWNTs) with the available highest specific surface area (more than 1000 m2/g) that provided very large interfacial area for the matrix to fabricate epoxy composite sheets. Through mechanical redirection of the SWNT alignment to horizontal to create a laterally aligned scaffold sheet, into which epoxy resin was impregnated. The SWNT scaffold was engineered in structure to meet the these two nearly mutually exclusive demands, i.e. to have nanometer meso-pores (2-50 nm) to facilitate homogeneous impregnation of the epoxy resin and to have mechanical strength to tolerate the compaction forces generated during impregnation. Through this approach, a SWNT/epoxy composite sheet with a nearly ideal morphology was realized where long and aligned SWNTs were loaded at high weight fraction (33 percent) with an intertube distance approaching the radius of gyration for polymers. The resultant composite showed a Young's modulus of 15.0 GPa and a tensile strength of 104 MPa, thus achieving 5.4 and 2.1 times reinforcement as compared to the neat epoxy resin.

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Date submitted: 11 Nov 2010 Electronic form version 1.4