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Shape Engineerable Single Walled Carbon Nanotube Solid as a Flexible Conducting Mesoporous Material DON N. FUTABA, KENJI HATA, TATSUKI HIRAOKA, TAKEO YAMADA, KOHEI MIZUNO, YUHEI HAYAMIZU, TATSUNORI NAMAI, YOZO KAKUDATE, OSAMU TANAIKE, HIROAKI HATORI, KOJI MIYAKE, SHINYA SASAKI, MOTOO YUMURA, SUMIO IIJIMA, National Institute of Advanced Industrial Science and Technology (AIST) — We present a new form of carbon nanotubes (CNT) material where CNTs are aligned and packed densely in a bulk solid. This single-walled carbon nanotube (SWNT) solid is fabricated from liquid-induced collapse of the sparse as-grown SWNT forest synthesized by super-growth CVD [1], which results in a 20x increase in mass density and a 70x increase in the Vickers hardness while retaining alignment and high surface area. As such, SWNT solid is an ideal form of CNTs for material and energy storage. The high surface area and well-defined microscopic structure imply that SWNT solid can be regarded as a conductive and flexible mesoporous material. In addition, we can engineer shapes suitable to the application. These unique characters make SWNT solid as a valuable material for supercapacitor electrodes and flexible heaters. Furthermore, we show how partial shrinking of the as-grown material creates a *handle* for robust mechanical and electrical connection to demonstrate exceptional tribological character and wear rate. The SWNT solid promises to open new frontiers in within the carbon nanotube field. [1] K. Hata *et al*, Science, **306**, 1241 (2004).

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