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Bulk Mechanical Properties of Single Walled Carbon Nanotube Electrodes MATTHEW GIARRA, BRIAN LANDI, CORY CRESS, RYNE RAFFAELLE, Rochester Institute of Technology — The unique properties of single walled carbon nanotubes (SWNTs) make them especially well suited for use as electrodes in power devices such as lithium ion batteries, hydrogen fuel cells, solar cells, and supercapacitors. The performances of such devices are expected to be influenced, at least in part, by the mechanical properties of the SWNTs used in composites or in stand alone "papers." Therefore, the elastic moduli and ultimate tensile strengths of SWNT papers were measured as functions of temperature, SWNT purity, SWNT length, and SWNT bundling. The SWNTs used to produce the papers were synthesized in an alexandrite laser vaporization reactor at 1100^{o}C and purified using conventional acid-reflux conditions. Characterization of the SWNTs was performed using SEM, BET, TGA, and optical and Raman spectroscopy. The purified material was filtered and dried to yield papers of bundled SWNTs which were analyzed using dynamic mechanical analysis (DMA). It was observed that the mechanical properties of acid-refluxed SWNT papers were significantly improved by controlled thermal oxidation and strain-hardening. Elastic moduli of SWNT papers were measured between 3 and 6 GPa. Ultimate (breaking) tensile stresses were measured between 45 and 90 MPa at 1-3% strain. These results and their implications in regard to potential applications in power devices will be discussed.

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