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Advanced Multifunctional Properties of Aligned Carbon Nanotube-Epoxy Composites from Carbon Nanotube Aerogel Method THANG TRAN, PENG LIU, ZENG FAN, NIGEL NGERN, HAI DUONG, National University of Singapore — Unlike previous methods of making carbon nanotube (CNT) thin films, aligned CNT thin films in this work are synthesized directly from CNT aerogels in a CVD process. CH_4/H_2/He gases and ferrocene/thiophene catalysts are mixed and reacted in the reactor at 1200 °C to form CNT aerogel socks. By pulling out the socks with a metal rod, CNT thin films with 15-nm diameter MWNTs are aligned and produced continuously at a speed of a few meters per minute. The number of the aligned CNT thin film layers/ thickness can also be controlled well. The as-synthesized aligned CNT films are further condensed by acetone spray and post-treated by UV light. The aligned CNT films without any above post-treatment have a high electrical conductivity of 400S/cm. We also develop aligned CNT-epoxy composites by infiltrating epoxy into the above aligned CNT thin films using Vacuum Assisted Resin Transfer Molding (VARTM) method. Our cost-effective fabrication method of the aligned CNT films is more advanced for developing the composites having CNT orientation control. The mechanical, electrical and optical properties of the aligned CNT epoxy composites are measured. About 2% of the aligned CNTs can enhance significantly the electrical conductivity and hardness of aligned CNT-epoxy composite films. Effects of morphologies, volume fraction, and alignment of the CNTs on the advanced multifunctional properties of the aligned CNT-epoxy composites are also quantified.

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