Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

High-performance supercapacitors, actuators and elastomeric composites based on CNT assemblies MIKHAIL KOZLOV, JIYOUNG OH, MINKYOON SHIN, RAQUEL ROBLES, MÁRCIO LIMA, RAY BAUGHMAN, University of Texas at Dallas — A number of materials ranging from carbon nanotube (CNT) yarns, sheets and CNT-based composites to shape memory alloys (SMA) have been explored for the application in the area of energy conversion and storage. Highly porous sheets comprised of Single Walled Carbon Nanotubes and doped polypyrrole (SWNT-PPy) were found to possess remarkably high specific capacitance of about 131 F/g; CNT-elastomeric polymer composites exhibited electrical conductivity of about 0.5 S/cm and can be stretched by 1400%. We found that if powered electrically, the isometric stress generated by the CNT-based actuators could be as large as 12 MPa. This approaches the stress generation capability of commercial ferroelectrics and is significantly larger than that of natural muscles. We also report several types of artificial muscles that convert the chemical energy of high–energy-density fuels to mechanical energy. Because of more than 30 times higher energy density obtainable for fuels like methanol, compared to that for the most advanced batteries, the major expected benefits are dramatic increase in energy conversion efficiency, work capacity, power performance.

Mikhail Kozlov
University of Texas at Dallas

Date submitted: 09 Dec 2008 Electronic form version 1.4