Carbon Nanotubes Chemically Bonded to Gold Electrodes for Supercapacitors.

Chaminda P. Nawarathne[1], Abdul Hoque[1], Nathan Strong[1] and Noe T. Alvarez[1]
[1]Department of Chemistry, University of Cincinnati, Cincinnati

Abstract

The demand for supercapacitors increased recently due to their high capacitance, long lifespan, and fast charge discharge rates. Carbon nanotubes (CNTs) can be considered as a promising carbon material for developing electric double layer capacitors or supercapacitors due to their excellent conductive, mechanical properties incorporated with high surface area. However, incorporating CNTs with metallic current collectors with strong but conductive bond is challenging due to the chemical structural differences between CNTs and the metal. Weak interactions between CNT and the metallic current collectors often cause high interface contact resistance which reduces the power density of the supercapacitor and causes short lifespan. In this work, vertically aligned CNTs were bonded to Au metal surfaces using a linker layer in between to achieve electrically conductive, strong bond. Surface characterization techniques were extensively used to confirm the strong bonding nature between Au-linker and Au-linker-CNTs. Fabricated CNT-Au material was developed as an electrode to fabricate a supercapacitor. The CNT-Au supercapacitor was characterized using cyclic voltammetry, galvanostatic charge discharge analysis and electrochemical impedance spectroscopy. Fabricated CNT-Au based double layer supercapacitor shows improved capacitance of 8.5 F/g with more than 50000 cycle stability.

Biography of Presenter

Chaminda Nawarathne is a PhD candidate at the Department of Chemistry, University of Cincinnati. Currently, he is working as a graduate assistant at the Alvarez lab and as a teaching assistant at the Department of Chemistry at the University of Cincinnati. His research is about investigating metal- Carbon nanotube hybrid for electronic applications, development of sensors using hybrid materials and investigating hybrid material utilization in energy storage devices. Furthermore, he is involved in a sensor development project with Kroger Company. Chaminda is originally from Sri Lanka where he received his Bachelor of Science degree in Chemistry from the University of Kelaniya, Sri Lanka. After graduating in 2018, he worked as a teaching assistant at the University of Kelaniya. Chaminda won the James O Koehler prize, Henry Hochstetter prize and doctorial enhancement fellowship for outstanding all-around contributions in research, teaching, and service to the Department. Currently, Chaminda has 5 publications and one patent application.