

Materials Electrochemical Study for Neurotransistors, Capacitors, and Batteries

Monday, March 16th
GWC 487
10:00 – 11:30 a.m.

ABSTRACT

Electrochemical processes involve ion transport, electron transport and transfer, and the subsequent redox reactions and material properties changes. They are the foundation of energy conversion and storage, as well as many other phenomena particularly new device concepts such as neuristors and neurotransistors. Following the main theme of electrochemical study, I will first give an introduction on our recently initiated research of Li-ion based neurotransistors and phase-change material based neuristors toward neuromorphic computation, and then focus on electrochemical energy storage devices. The R&D work on kilo hertz (kHz) frequency electrochemical capacitors (ECs) will be presented, aiming to develop compact kHz ECs as a filtering capacitor in substitution of the bulky aluminum electrolytic capacitor for low power applications. Nanostructured electrode design and its impacts on frequency response of ECs will be emphasized. In the last part, I will highlight our studies on batteries, particularly lithium-sulfur battery technology. Challenging issues on the sulfur cathode design, particularly how to physically and chemically confining the soluble polysulfides and catalyze their conversion rates to minimize their shuttling effects will be discussed, toward the goal of doubling the energy density of current Li-ion battery technology to 500 Wh/kg.

BIOGRAPHY



Biography: Dr. Fan obtained his bachelor (1991) and master (1994) degrees from Tsinghua University of China and Ph.D. (2001) from Northwestern University of U.S. Since 2008, he has been working at Texas Tech University and is currently a professor in Electrical and Computer Engineering and an adjunct professor in Physics. Before that, Dr. Fan led R&D efforts in a startup company, pioneering the development of MicroLED Display and high-voltage LED lighting technology in the world. His research interests encompass semiconductors and functional oxides, perovskite photovoltaic materials, and electrode materials for supercapacitors and batteries. He is an Ed and Linda Whitacre Faculty Fellow at Texas Tech and one of 66 academic inventors elected to the National Academy of Inventors' inaugural class of Senior Members in 2019.