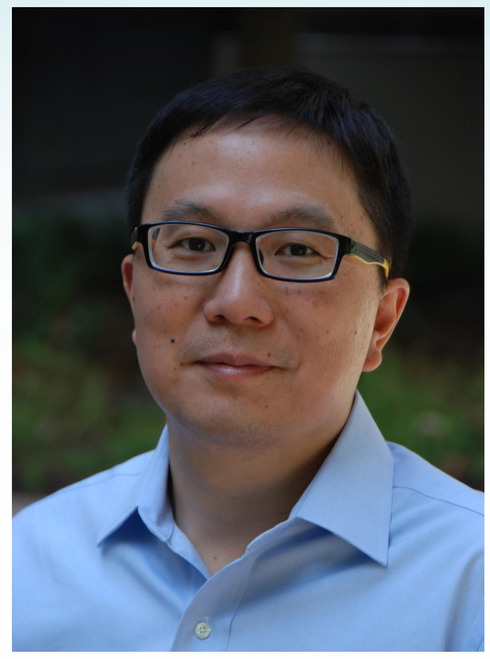
Academic Lecture

State Key Laboratory of Chemical Resource Engineering

Charge Transport in 3D Holey Graphene Composite for Ultrahigh Rate Energy Storage



报告人：段镶锋 教授 *(UCLA, USA）*

时　间：2017-08-30 (周三)上午 10:30-11:30

地　点：图书馆一层中心会议室

报告简介：

Supercapacitors and batteries represent two distinct electrochemical energy storage devices of increasing import ance for applications in mobile electronics, electric vehicles, and renewable energy industry. A common feature of these devices involves coupled ion transport (and storage) and electron transport in active electrode materials. Tremendous progress has been made in new electrode materials (e.g., silicon and niobia) that may promise far h igher energy or power density than those of today's batteries. However, these new materials have thus far failed to deliver their promise in practical devices because the exceptional performance is typically only achieved in ul trathin electrodes with very low mass loadings (< 1 mg cm^{-2}) and cannot be easily scaled into devices with pract ical levels of mass loading (>10 mg cm^{-2}). To sustain the same electrochemical performance in practical electro des with higher mass loading requires the delivery of proportionally more charge (both electrons and ions) acros s a proportionally longer distance, which represents a formidable challenge, particularly for new electrode mater ials with intrinsically higher capacity or rate capability that require the correspondingly higher charge delivery r ate. In this talk, I will discuss the critical role of charge transport in electrochemical devices how their performa nce can be dramatically affected by tailoring the charge transport process. In particular, I will describe the desig n of a three-dimensional holey graphene framework (3D-HGF) as an ideal conductive scaffold for electrochemi cal materials. The 3D-HGF features a highly interconnected graphene network for excellent electron transport, a hierarchical porous structure for rapid ion transport, and an ultrahigh high surface area for the efficient loading of electrochemical active nanostructures without sacrificing reaction efficiency. By systematically tailoring the porosity in the holey graphene backbone, we show charge transport in the composite architecture can be optimiz ed to enable a HGF/niobia or HGF/Si composite anode with an unprecedented combination of high areal capacit y and high areal current density at practical levels of mass loadings (>10 mg cm-2), marking c ritical step towar ds applying high performance electrode materials in practical devices.

报告人简介：

Prof. Duan received his B.S. Degree from University of Science and Technology of China in 1997, a nd Ph.D. degree from Harvard University in 2002. He was a Founding Scientist and then Manager of Advanced Technology at Nanosys Inc., a nanotechnology startup founded based partly on his doctora l research. Dr. Duan joined UCLA with a Howard Reiss Career Development Chair in 2008, and was promoted to Associate Professor in 2012 and Full Professor in 2013. Dr. Duan has published over 20 0 papers with over 30,000 citations, and holds over 40 issued US patents.

化工资源有效利用国家重点实验室
北京化工大学引进人才孵化平台
汪乐余教授邀请