Abstract

Lithium-based batteries (LBs) have got tremendous attention due to their high energy and power densities and have been considered as promising power source for future electric vehicles (EVs). Thus, most of the present research is focused on new electrode materials that can bring the realization of these devices for EVs. However, structural disintegration, limited access to redox sites and loss of electrical contact have long been identified as primary reasons for capacity loss and poor cyclic life of these materials. Thus, a precise design can inhibit the side reaction by surface protection, make all redox sites accessible by increasing the intrinsic conductivity of the active materials, maintain a continues network for ionic and electronic flow and keep the structural integrity, resulting improved performance and excellent capacity retention with long cyclic life to meet the requirements set by USABC for electrode materials in EVs. Here, we have develop different hybrid nanostructures of metal oxides, nitrides, sulfides, hydroxides and metal alloys with doped graphene to control above mentioned problems and to achieve the goals set by USABC. All these composites possess extraordinary performances as electrodes of LBs with long cyclic stability and excellent rate capability. The high performance of the composites based on the synergistic effect of several components in the nanodesign. These strategies to combine the different property enhancing factors in one composite with engineered structures will bring the realization of these devices in broad markets.

Biography

Dr Yanglong Hou is currently a Chang Jiang Chair Professor of Materials Science and Engineering at Peking University (PKU). He received his M. S. degree (in Applied Chemistry) in 1998 and Ph.D. degree (in Materials Science) in 2000, respectively, from Harbin Institute of Technology. After that, he worked as postdoctoral fellow at Peking University from 2000-2002, as JSPS fellow at the University of Tokyo from 2002-2005 and as research associate at Brown University from 2005-2007, respectively. In December 2007, Dr. Hou joined College of Engineering at Peking University, where he was appointed as tenure-track Professor. He was promoted to Professor in 2012 and to Chang Jiang Chair Professor in 2014.

Professor Hou’s current research is focused on the design and chemical synthesis of functional nanoparticles and graphene, and their biomedical and energy-related applications. His research makes impacted contribution in monodisperse magnetic nanoparticles, magnetic nanoparticle-based molecular probes for diagnosis and therapy, and graphene-based composites for energy conversion and storage, in which has produced 12 China patents and over 130 papers in prestigious journals, including Accounts Chem. Res., Adv. Mater., J. Am. Chem. Soc. and Angew. Chem. Int. Ed.. Professor Hou’s research excellence was recognized by an elected JSPS fellow in 2003, Outstanding Young Investigator of National Natural Science Foundation of China (NSFC) in 2011, the Green Biomedical Award in 2012, CCS-RSC Young Chemist Award in 2013, Changjiang Chair Professorship of MOE and Young Talent Leadership of Science and Technology of MOST in 2014, Graphene Award supported by the International Advanced Materials Association and “Ten-thousand Talent Plan” in 2016. His research has also been highlighted 12 times as the covers or frontispieces of prestigious journals and widely reported by APS News, Technology Reviews, Materials Views and China Science Newspapers.

Professor Hou is currently an associate editor of Rare Metals, an Editorial Board Member of several international journals including Advanced Science, Scientific Reports, Rare Metals, and Advance in Chemistry, etc. He has also been invited to deliver talks for over 40 times in international conferences, and review proposals for funding agencies worldwide, including the Georgia and Singapore.
Thursday, 26 April 2018 || Time: 4:00 pm – 5:00 pm ||
Venue: MSE Conference Room (N4.1-02-02)
Hosted by: Associate Professor Xu Zhichuan, Jason

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