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Title |

Reinventing Batteries

Abstract | The fast growth of portable power sources for transportation and grid-scale stationary storage presents great opportunities for battery development. The invention of lithium ion batteries has been recognized with Nobel Prize in 2019. How to increase energy density, reduce cost, speed up charging, extend life, enhance safety and reuse/recycle are critical challenges. Here I will present the 15 year research in my lab to reinvent batteries and address many of challenges by understanding the materials and interfaces through new tools and providing guiding principles for design. The topics to be discussed include: 1) A breakthrough tool of cryogenic electron microscopy, leading to atomic scale resolution of fragile battery materials and interfaces. 2) Materials design to enable high capacity materials: Si and Li metal anodes and S cathodes. 3) Interfacial design with polymer and inorganic coating to enhance cycling efficiency of battery electrodes. 4) Materials design for safety enhancement. 6) Lithium extraction from sea water and for battery recycling. 7) New battery chemistry for grid scale storage.

Bio | [Yi Cui](#) is a Professor in the Department of Materials Science and Engineering at Stanford University. He received B.S. in Chemistry in 1998 at the University of Science and Technology of China (USTC), Ph.D in 2002 at Harvard University. After that, he went on to work as a Miller Postdoctoral Fellow at University of California, Berkeley. In 2005 he became an Assistant Professor in the Department of Materials Science and Engineering at Stanford University. In 2010 he was promoted with tenure. He has published ~510 research papers and has an H-index of 206 (Google). In 2014, he was ranked NO.1 in Materials Science by Thomson Reuters as “The World’s Most Influential Scientific Minds”. He is an elected Fellow of American Association for the Advancement of Science, Materials Research Society, Electrochemical Society and Royal Society of Chemistry. He is an Executive Editor of Nano Letters. He is a Co-Director of the Bay Area Photovoltaics Consortium, a Co-Director of Battery 500 Consortium and Co-Director of Stanford StorageX Initiative. His selected awards include: MRS Medal (2020), Dan Maydan Prize in Nanoscience (2019), Nano Today Award (2019), Blavatnik National Laureate (2017), MRS Kavli Distinguished Lectureship in Nanoscience (2015), the Sloan Research Fellowship (2010), KAUST Investigator Award (2008), ONR Young Investigator Award (2008), Technology Review World Top Young Innovator Award (2004). He has founded four companies to commercialize technologies from his group: Amprius Inc., 4C Air Inc., EEnotech Inc. and EnerVenue Inc.

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