Bin Zhu, J Fundam Renewable Energy Appl 2018, Volume 8
DOI: 10.4172/2090-4541-C5-061

3rd International Conference on

Battery and Fuel Cell Technology

September 10-11, 2018 | London, UK

Bin Zhu

Hubei University, China

Semiconductor and semiconductor-ionic materials for new generation fuel cells

Currently two research fields are strongly correlated from semiconductor and ionic materials (SIMs), semiconductor physics and ionics, which have created three in one electrolyte-free fuel cell technology and science because one SIM can integrate fuel cell all functions of anode, electrolyte and cathode. Some SIMs has shown properties as analogs of topological insulators. Semiconductor electronic band can induce ionic conducting properties and ionic defects can also make band structure changes. Therefore, the electrons and ions are strongly correlated resulting in superionic conduction and new material properties. The crosslink approaches from electrons and ions based on extensive experimental discoveries have made a strong indication for a promising research frontier: Semiconductor-ionics (Semionics). In a brief, Semionics studies the ionic properties and transport phenomena in semiconductors. It gives a new scientific thinking and idea to a combination of SIMs based on a fact: large numbers of the TMs (insulators and semi-metals) have been discovered to be compatible to the semiconductor-ionic devices, e.g. electrolyte (layer)-free fuel cell (EFFC) or semiconductor-ionic fuel cells (SIFCs). These novel functional materials and devices can be defined today as the third route of the electrochem-physical fuel-to-electricity power generation, which is between Grove 1939 electrochemical fuel cell and Watt (1776)-Siemens (1866) heat machine dynamo electro-mechanical power generation. The latter results in today industrialization and civilization but the fuel cell is still challenging for commercialization. Our route is design by Physics for the fuel-power generation by combining fuel cell advantages as a new way. The semiconductor ion properties and transport and energy band play a key role by integrating electrocatalyst function, in which Physics and Physical methodology play a central role. We are working on both theoretical approaches and experiments to develop and establish a new discipline on Semionics and SIMs for advanced energy applications.

Biography

Bin Zhu, PhD, PhD Adviser to KTH Fuel cell and solar cell group Chair professor in China University of Geoscience and Hubei University appointed by Hubei 100 overseas talent program Visiting professor position appointed by Loughborough University, UK. One of the most cited scholars in China (Energy sector) for 2014, 2015, 2016 and 2017 (Elsevier). Guest professor for University of Science and Technology of China (USTC), Tianjin University and Southeast University Coordinator for EC-China NANOCOFC (Nanocomposites for advanced fuel cell) research network.

binzhu@kth.se