Bin Zhu, Res. Rev. J Mat. Sci. 2018, Volume 6
DOI: 10.4172/2321-6212-C3-019

Bin Zhu

Hubei University, China

Semiconductors and semiconductor ionic hetero-structure composites for next generation energy conversion technology

Studies on ionic mobility in semiconductor lead to new generation electron and semiconductor devices, e.g., Displays, valve switches, new memory devices, superconducting devices, super magnetic devices, electro chemical transistors, low-power electronics and novel sensing energy devices etc., but ionic properties and transports missing that has the same or more important significance than ionic effects on electrons, because the electronic effect on ions and movement to be widely applied for new generation energy technologies. Over hundred years, people have designed and looked for ionic conductors and ionic conductivity only focusing on so called ionic materials or conductors, but challenge unsolved, typically, solid oxide fuel cell (SOFC), yttrium stabilized zirconia (YSZ), which needs high operational temperature in excess of 700°C to operate properly, dominated the SOFC technology over hundred years, not yet commercially. The traditional ionic electrolyte, e.g., YSZ can be now replaced by semiconductor and semiconductor ionic properties and materials we have developed to demonstrate higher device performance at temperatures well below 600°C and much simpler technology, e.g., single component fuel cell to replace traditional anode, electrolyte and catholic three components fuel cell technology. Turning to semiconductors, to develop semiconductor ionic property and conductivity, we can reach ever higher ion conductivity which has demonstrated better fuel cell performance and simpler technology. Semiconductor and semiconductor-ionic hetero structure composites are leading to next generation energy devices.

Recent Publications

1. Zhu B, Raza R, Abbas G and Singh M (2011) An Electrolyte-Free Fuel Cell Constructed from One Homogenous Layer with Mixed Conductivity. Advanced Functional Materials 21:2465-2469
2. Zhu B, Raza R, Qin H, Liu Q and Fan L (2011) Fuel cells based on electrolyte and non-electrolyte separators. Energy & Environmental Science 4(8):42986-2992.
3. Zhu B, Qin H, Raza R, Liu Q, Fan L, Patakangas J and Lund P (2011) A single-component fuel cell reactor. International Journal of Hydrogen Energy 36:8536-8541.
4. Zhu B, Raza R, Qin H and Fan L (2011) Single-component and three-component fuel cells. Journal of Power Sources 196(15):6362-6365.
5. Zhu et al. (2013) A new energy conversion technology based on nano-redox and nano-device processes. Nano Energy 2(6):1179-1185.

Biograpy

Bin Zhu received MSc degree from University of Science and Technology of China in 1987 and PhD from Chalmers University of Technology, Physics and Engineering Physics, Sweden in 1995. During October 1995 to December 1997, he worked as Postdoc at Uppsala University, Ångström Laboratory. Since 1998, he moved to KTH and in 1999 became Associate Professor in Department of Chemical Engineering and Technology, and now in Department of Energy Technology, KTH. He is a Visiting Professor at Aalto University and Nanyang Technological University as well as he acted as Guest Professor and Professor at several Chinese universities to co-supervise research projects and PhD students. From 2018, he has been appointed as Visiting Professor, an honorary appointment at Loughborough University, UK.

binzhu@kth.se