POSTER ABSRACT

Aluminum-ion Batteries: a New Solution for Energy Storage beyond Li-ion Batteries

Hansan Liu,[1] Xiao-guang Sun,[1] Zhonghe Bi,[1] M. Parans Paranthaman,[1] A. Manthiram,[2] and Gilbert M. Brown[1*]

[1]Chemical Sciences Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831
[2]Materials Science and Engineering Program, The University of Texas at Austin, Austin, TX 78712

Advanced rechargeable batteries with high energy density are critical enabling technologies for the development of next generation of electric vehicles and for effective utilization of electricity generated from renewable sources such as solar and wind. In the Department of Energy's Office of Basic Energy Sciences (DOE-BES) report on its "Basic Research Needs Workshop for Electrical Energy Storage", investigation of multi-electron redox couples was listed as a priority research direction to achieve radical increases in charge storage density. Herein, we propose a new concept of aluminum-ion batteries to seek a breakthrough in energy storage by a tri-electron redox process. This new battery chemistry, which adopts aluminum or aluminum intercalation compounds as electrodes and ionic liquids as electrolytes, has many advantages compared to the current lithium-ion batteries: higher energy density due to the tri-valence of aluminum ions; low cost because of the abundant aluminum resources; safer operation owing to non-flammable ionic liquids. To this end, we have been undertaking a systematic study to identify suitable anodes, electrolytes, and cathodes for this new battery chemistry. In this poster, we will present our results on the feasibility of using manganese oxides as cathodes with metallic aluminum anode in different ionic liquid electrolytes.

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[*] Corresponding author: browngm1@ornl.gov