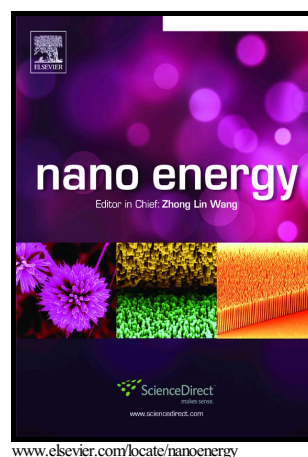


Author's Accepted Manuscript

A high-energy and low-cost polysulfide/iodide redox flow battery

Zhejun Li, Guoming Weng, Qingli Zou, Guangtao Cong, Yi-Chun Lu



PII: S2211-2855(16)30415-3
DOI: <http://dx.doi.org/10.1016/j.nanoen.2016.09.043>
Reference: NANOEN1522

To appear in: *Nano Energy*

Received date: 21 August 2016
Revised date: 24 September 2016
Accepted date: 26 September 2016

Cite this article as: Zhejun Li, Guoming Weng, Qingli Zou, Guangtao Cong and Yi-Chun Lu, A high-energy and low-cost polysulfide/iodide redox flow battery, *Nano Energy*, <http://dx.doi.org/10.1016/j.nanoen.2016.09.043>

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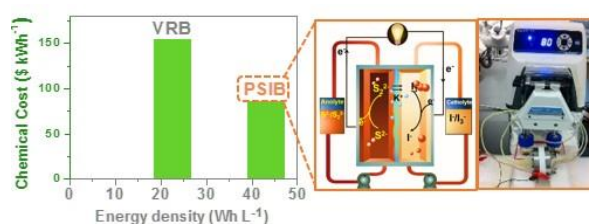
Electrochemical Energy and Interfaces Laboratory, Department of Mechanical and Automation Engineering, The Chinese University of Hong Kong, Shatin, N.T. 999077, Hong Kong SAR, China.

*Correspondence to: yichunlu@mae.cuhk.edu.hk

Abstract

Redox flow batteries (RFBs) have been limited by low energy density and high cost. Here, we employ highly-soluble, inexpensive and reversible polysulfide and iodide species to demonstrate a high-energy and low-cost *all-liquid* polysulfide/iodide redox flow battery (PSIB). In contrast to metal-hybrid or semi-solid approaches that are usually adapted for high-energy RFBs, the all-liquid characteristic of the PSIB is crucial to enable practical scale-up development. Combining the achieved energy density ($43.1 \text{ Wh L}^{-1}_{\text{Catholyte+Anolyte}}$) and the inherent low materials cost of sulfur and iodine compared to vanadium, the PSIB system demonstrates a significantly lower materials cost per kilowatt hour ($\$ 85.4 \text{ kWh}^{-1}$) compared to the state-of-the-art vanadium-based redox flow batteries ($\$ 152.0 - 154.6 \text{ kWh}^{-1}$). *Operando* UV-Visible spectroscopy reveals superior electrochemical reversibility of both electrolytes. With its demonstrated energy density, inherent low material cost and benign chemical natures, the *all-liquid* PSIB offers a promising solution for high-energy-density and low-cost energy storage applications.

Graphic Abstract.



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