

High performance freestanding composite cathode for lithium-sulfur batteries

Almagul Mentbayeva, Ayaulym Belgibayeva, Nurzhan Umirov, Yongguang Zhang, Izumi Taniguchi, Indira Kurmanbayeva, [Zhumabay Bakenov](#)

- [Department of Chemical Engineering](#)

Abstract

A freestanding sulfur/dehydrogenated polyacrylonitrile/multiwalled carbon nanotube composite (S/DPAN/MWCNT) was prepared by a simple vacuum filtration of a mixture of S/DPAN composite and MWCNT suspensions, and studied as a cathode for high performance lithium-sulfur batteries. SEM and EDS analysis revealed uniform distribution of sulfur in a conductive pyrolyzed polyacrylonitrile host matrix with MWCNT integrated into the composite. Self-weaving MWCNT create an electronically conductive network and reinforce structural stability of the system, leading to an outstanding electrochemical performance of the composite cathode. Binder/current collector-free composite cathode exhibits high capacities of 1450 mAh g^{-1} at 0.2 C and 930 mAh g^{-1} at 2 C charge-discharge rates. A high discharge capacity of 1250 mAh g^{-1} is achieved after 260 cycles at 0.2 C with a coulombic efficiency around 100%.

Original language	English
Pages (from-to)	242-248
Number of pages	7
Journal	Electrochimica Acta
Volume	217
State	Published - Nov 1 2016

Mentbayeva, A., Belgibayeva, A., Umirov, N., Zhang, Y., Taniguchi, I., Kurmanbayeva, I., & Bakenov, Z. (2016). *High performance freestanding composite cathode for lithium-sulfur batteries*. *Electrochimica Acta*, 217, 242-248. DOI: 10.1016/j.electacta.2016.09.082