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www.elsevier.com/locate/memsci

PII: S0376-7388(16)30124-7
DOI: http://dx.doi.org/10.1016/j.memsci.2016.02.067
Reference: MEMSCI14334

To appear in: *Journal of Membrane Science*

Received date: 19 October 2015
Revised date: 20 February 2016
Accepted date: 27 February 2016

Cite this article as: Fengjing Jiang, Yu Nie, Lei Yin, Yuan Feng, Qingchun Yu and Chunyan Zhong, Core-shell-structured nanofibrous membrane as advanced separator for lithium-ion batteries, *Journal of Membrane Science* http://dx.doi.org/10.1016/j.memsci.2016.02.067

Core-Shell-Structured Nanofibrous Membrane as Advanced Separator for Lithium-ion Batteries

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Abstract

Ceramic-layer coated Lithium ion batteries (LIBs) separator shows excellent thermal stability, good electrolyte wettability, but usually poor mechanical strength. For the first time, Silica Encapsulated Nanofibrous Separator (SENS), in which ceramic coating layer is covalently bonded to the polymer nanofibers, is prepared as an advanced composite separator for LIBs. Properties of SENS including morphology, ionic conductivity, electrochemical stability, thermal stability, mechanical strength and battery performance were characterized. Because of the unique SiO_2-coating structure and cross-linked three-dimensional network, SENS shows significant advantages of good thermal stability up to 200 ℃, high ionic conductivity, excellent coating strength and improved battery charge-discharge performance.

Keywords: lithium ion battery; separator; wettability; thermal stable; composite membrane.

1. Introduction

With the increasing demand for clean and renewable energy resources, energy storage technologies have attracted great interest during the past decades. Lithium-ion batteries (LIBs) [1,