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International Journal of Energy Research

INTERNATIONAL JOURNAL OF ENERGY RESEARCH
Int. J. Energy Res. (2012)
Published online in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/er.2999

TECHNICAL NOTE

A validation study of lithium-ion cell constant c-rate discharge simulation with Battery Design Studio®

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Publisher:
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Date:
Tuesday, November 6, 2012
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Abstract:

We compare battery performance simulations from a commercial lithium-ion battery modeling software package against manufacturer performance specifications and laboratory tests to assess model validity. A set of commercially manufactured spiral wound lithium-ion cells were electrochemically tested and then disassembled and physically characterized. The Battery Design Studio® (BDS) software was then used to create a mathematical model of each battery, and discharge simulations at constant C-rates ranging from C/5 to 2C were compared against laboratory tests and manufacturer performance specifications. Results indicate that BDS predictions of total energy delivered under our constant C-rate battery discharge tests are within 6.5% of laboratory measurements for a full discharge and within 2.8% when a 60% state of charge window is considered. Average discrepancy is substantially lower. In all cases, the discrepancy in simulated vs. manufacturer specifications or laboratory results of energy and capacity delivered was comparable to the discrepancy between manufacturer specifications and laboratory results. Results suggest that BDS can provide sufficient accuracy in discharge performance simulations for many applications. Copyright © 2012 John Wiley & Sons, Ltd.

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