Physical characterization of the charging process of a Li-ion battery and prediction of Li plating by electrochemical modeling

N. Legrand, B. Knosp, P. Desprez, F. Lapicque, S. Ra¼

PII: S0378-7753(13)01137-3

DOI: 10.1016/j.jpowsour.2013.06.130

Reference: POWER 17659

To appear in: *Journal of Power Sources*

Received Date: 29 April 2013

Revised Date: 17 June 2013

Accepted Date: 21 June 2013

Please cite this article as: N. Legrand , B. Knosp, P. Desprez, F. Lapicque, S. Ra¼, Physical characterization of the charging process of a Li-ion battery and prediction of Li plating by electrochemical modeling, *Journal of Power Sources* (2013), doi: 10.1016/j.jpowsour.2013.06.130.

Physical characterization of the charging process of a Li-ion battery and prediction of Li plating by electrochemical modeling

N. Legrand[a, b, c*], B. Knosp[a], P. Desprez[a], F. Lapicque[b], S. Raël[c]

[a] *SAFT, Direction de la Recherche, 111/113 boulevard Alfred Daney, 33074 Bordeaux Cedex, France*

[b] *LRGP, CNRS – Université de Lorraine, BP 20451, 54001 Nancy, France*

[c] *Université de Lorraine, GREEN, 54518, Vandoeuvre-lès-Nancy,, France*

*corresponding author

Phone: +33 557 10 94 85

Fax: +33 557 10 68 77.

Email: nathalie.legrand@saftbatteries.com

Abstract

This paper deals with occurrence of lithium plating on the negative electrode of lithium-ion batteries, a significant ageing phenomenon known to damage lithium-ion battery performances. As a matter of fact, deposition of metal Li layer at the surface of the negative electrode induces mismatching between positive and negative electrodes and consequently capacity losses.

Charge transfer process, one of the two different steps of the process of Li insertion in the negative active material being the cause of this ageing, was considered here to be the limiting process. This transfer occurs at short-time scales. The second process, the diffusion of lithium in the solid insertion compound, occurring at relatively long-time scales, has not been fully examined here.