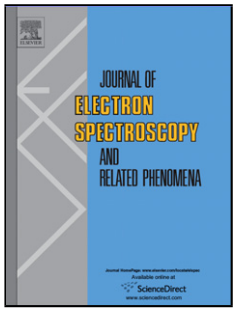

Title: Oxygen redox reactions in Li ion battery electrodes studied by resonant inelastic x-ray scattering

Author: L.-C. Duda K. Edström

PII: S0368-2048(16)30154-2
DOI: http://dx.doi.org/doi:10.1016/j.elspec.2017.06.003
Reference: ELSPEC 46682

To appear in: *Journal of Electron Spectroscopy and Related Phenomena*

Received date: 21-10-2016
Revised date: 10-5-2017
Accepted date: 19-6-2017

Please cite this article as: L.-C. Duda, K. Edstr*ddoto*m, Oxygen redox reactions in Li ion battery electrodes studied by resonant inelastic x-ray scattering, *<![CDATA[Journal of Electron Spectroscopy and Related Phenomena]]>* (2017), http://dx.doi.org/10.1016/j.elspec.2017.06.003

Oxygen redox reactions in Li ion battery electrodes studied by resonant inelastic x-ray scattering

L.-C. Duda[a], K. Edström[b]

[a] *Department of Physics and Astronomy, Division of Molecular and Condensed Matter Physics, Uppsala University, Box 516, S-751 20 Uppsala, Sweden*
[b] *Department of Chemistry - Ångström Laboratory, Uppsala University, Box 538, S-751 21 Uppsala, Sweden*

Abstract

We present results using inelastic scattering x-ray spectroscopy (RIXS) combined with x-ray absorption spectroscopy on Li ion battery cathode and anode materials, respectively. In particular, we discuss results obtained on the cathode materials $Li_{1.2}[Ni_{0.13}Co_{0.133}Mn_{0.544}]O_2$ and $Li_x[Ni_{0.65}Co_{0.25}Mn_{0.1}]O_2$ as well as in the composite anode material $Ni_{0.5}TiOPO_4/C$. We show that oxygen redox reactions are an important aspect of many such systems and how one can succesfully address them using RIXS. New insights on the formation of new oxygen species and on the details of cycling-induced structural disorder can be detected. We foresee a particular future focus on these issues considering the rapid development of new *in operando* RIXS techniques for Li ion battery research.

Key words: Li ion battery, anionic redox, resonant inelastic x-ray scattering

1. Introduction

Li ion batteries are found in a variety of applications ranging from large scale grids, to energy sources for electrically powered vehicles, to consumer electronics [1, 2]. There is a strong desire to keep improving battery performance, in particular to increase their capacity and the power density. Understanding the redox processes in Li ion batteries on an atomic level is crucial for the development of materials for the various battery components and for finding