

Mechanism Panel Abstract & Speaker Biography

Qualitative analysis of GITT measurements of Li-S batteries

Nuria Garcia-Araez, James W. Dibden, and John R. Owen

University of Southampton, Highfield Campus, Southampton, United Kingdom

Galvanostatic Intermittent Titration Technique (GITT) is a powerful characterization tool for batteries that provides key thermodynamic and kinetic information about battery performance. For example, GITT has been applied to evaluate the value of the ambipolar diffusion coefficient of lithium in lithium-ion batteries, which is a key property that determines the battery rate performance [1]. The application of GITT to lithium-sulfur batteries seems to be even more interesting, since the measurements reveal a rich set of information about the reaction mechanism, the timescales of the different steps and the unusual properties of polysulfide solutions formed in-situ in lithium-sulfur batteries. GITT data obtained with lithium-sulfur batteries has been used to obtain qualitative information about the rate of the shuttle mechanism, which is a key issue in lithium-sulfur batteries that leads to capacity fading and self-discharge [2]. In this work, we develop for the first time a qualitative analysis of GITT data of Li-S batteries, and we demonstrate that these measurements can be used to evaluate the effective diffusion coefficient of polysulfides in lithium-sulfur batteries and the values of activity coefficient of polysulfides in these unusually highly concentrated electrolyte solutions that are formed during the operation of lithium-sulfur batteries [3].

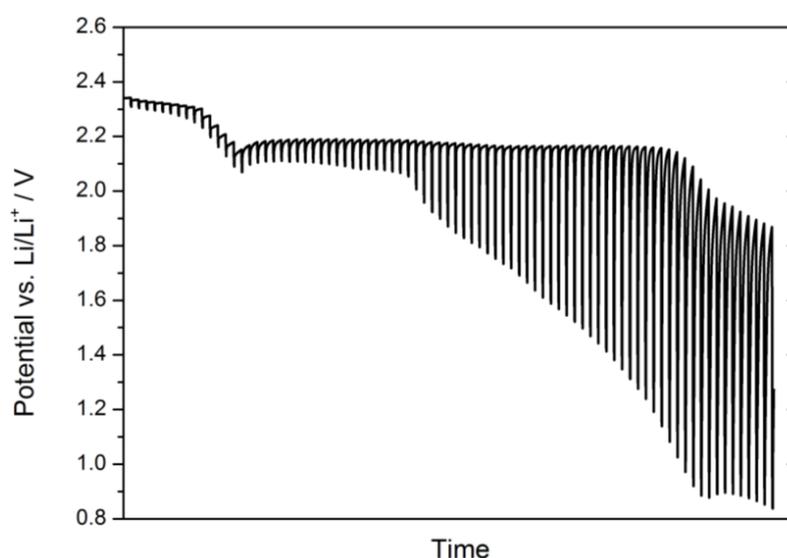


Figure 1. GITT discharge profile of a Li-S battery

References:

1. W. Weppner, R. A. Huggins. *J. Electrochem. Soc.* 124 (1977) 1569-1578.
2. M. Rolf Busche, P. Adelhelm, H. Sommer, H. Schneider, K. Leitner, J. Janek. *J. Power Sources* 259 (2014) 289-299.
3. J. W. Dibden, J. W. Smith, N. Zhou, N. Garcia-Araez, J.R. Owen. *Chem. Commun.* (submitted)

Speaker Biography:

Nuria Garcia-Araez is a lecturer in electrochemistry at Southampton. She has a multidisciplinary background on fundamental electrochemistry and in-situ characterization techniques and her current interests are the development of the next generation of rechargeable batteries, with focus on lithium-oxygen and lithium-sulfur batteries, and new methods of lithium production and recycling.

Nuria Garcia-Araez obtained her first-class degree in Chemistry in 2002 at the University of Alicante (Spain), where she also got her Ph.D. (cum laude) in 2007 in the field of single-crystal electrochemistry under the supervision of Prof. Juan Feliu and Dr. Victor Climent. Then, she received a Marie-Curie Intra-European Fellowship and a postdoctoral fellowship by the Spanish Ministry of Science and Innovation to work in the group of Prof. Huib Bakker at AMOLF and Prof. Mark Koper at Leiden University (The Netherlands) on the application of a variety of optical and nonlinear optical techniques to study the structure and dynamics of water near ions and at electrochemical interfaces. In 2011, she obtained a position as a senior scientist in the group of Prof. Petr Novak at the Paul Scherrer Institut in Switzerland to study lithium-air batteries. In 2012 she was appointed lecturer in electrochemistry at the University of Southampton. Over the course of her career, she has been awarded 9 academic prizes, including the Best Spanish Young Electrochemist award by CIDETEC in 2012. In 2016, she received a prestigious Early Career Researcher Fellowship by the EPSRC.

