Important Aspects on the Fabrication and Characterization of Lithium-Sulfur Batteries

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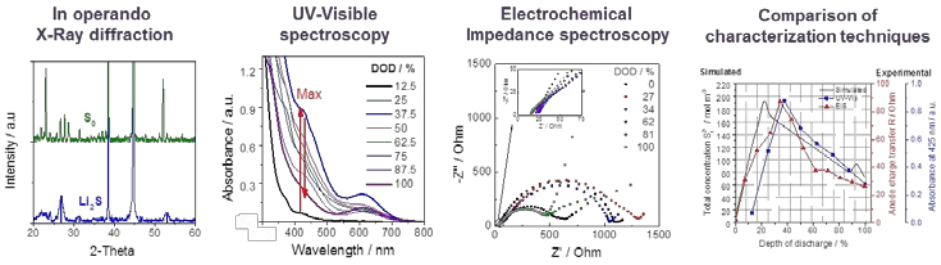
The lithium sulfur (Li-S) battery is a promising system for the future generation of rechargeable batteries. The main advantages of this type of cell are the high theoretical capacity (1675 $Ah \cdot kg^{-1}$), high energy density (2500 $Wh \cdot kg^{-1}$) and low cost of sulfur. However, degradation of the cathode is difficult to alleviate because of the complex electrochemistry of the Li-S system. In these work, simple approaches on the battery fabrication and it influences on the stability of the cell are presented. Furthermore, these investigations aim to understand the critical issues associated with the electrochemical processes occurring in Li-S batteries, establishing methods and procedures necessary to investigate this system. The result obtained through the use of the following characterization techniques are compared and analyzed: (a) X-ray diffraction for detection and quantification of crystalline products Li_2S and S_8 [1], (b) electrochemical impedance spectroscopy for analysis of electrolyte resistance, charge transfer resistance in the electrodes, and reaction and dissolution Li_2S and S_8 [2], (c) UV-Vis spectroscopy for detection and quantification of dissolved species (mainly polysulfides) [3], (d) Atomic force microscopy for surface analysis and formation of isolating layers, (e) Thermal analysis (TG/DSC) and mass spectroscopy to study the degradation of components and morphological changes on the cathode.



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[2] N.A. Cañas, K. Hirose, N. Wagner, B. Pascucci, N. Wagner, K.A Friedrich, R. Hiesgen, Electrochim. Acta, 97 (2013) 42-51.
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