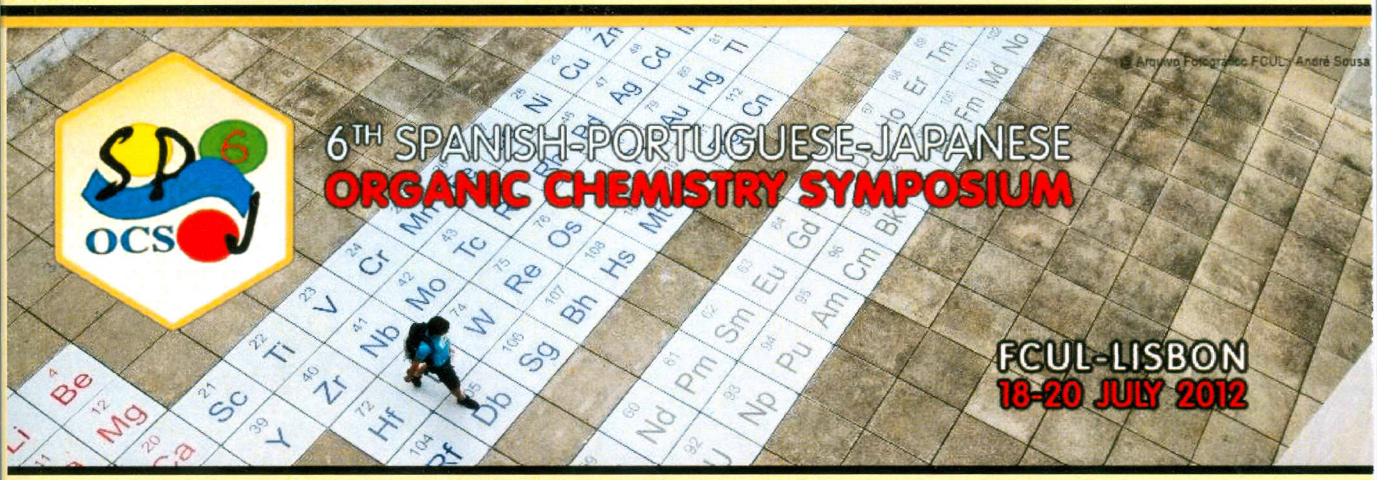

BOOK OF ABSTRACTS

6SPJ-OCS

Faculty of Sciences, University of Lisbon

18-20 July 2012

PORTUGAL

P107

DEVELOPMENT OF NEW ELECTRODE MATERIALS FOR ORGANIC ELECTRO-ACTIVE RECHARGEABLE BATTERIES

O. R. Furtado, T. I. Paiva and C. M. Rangel

LNEG, Unidade de Pilhas de Combustível e Hidrogénio,
Estrada do Paço do Lumiar, 1649-038 Lisboa, Portugal
olivia.furtado@lneg.pt

The increase in the autonomy of electric vehicles is directly associated with the increase of energy density in current batteries. The automobile industry plans to double within 10 years, the energy density of lithium ion batteries currently available, so that the autonomy of vehicles approaches the 500km. This implies a substantial *R&D* effort focused on the identification and development of materials that may allow higher energy densities, environmental compatibility and lower cost than the state of the art inorganic lithium-ion batteries. Rechargeable batteries consisting of organic base electrodes are increasingly being studied as an alternative to conventional metal electrodes.[1,2] The positive electrode active material of these batteries critically influences their energy density and the charge / discharge process; also represents the higher mass fraction and the most expensive element. The approach adopted in this work involves the development of new cathode organic materials based on polyimide derivatives with significant redox potential or capacity in order to increase stability and significantly improve the energy density of current lithium ion cells. Synthesis and characterization of organic compounds derived from organic polymeric polyimides were carried out, followed by their integration in an electrode structure that uses carbon nanofibers, as a support and as a means to increase conductivity. An electrochemical study based on cyclic voltammetry was conducted in order to evaluate the performance and redox capacity of the electrodes in a half-cell configuration. The implemented strategy is based on the fact that the aromatic imide group may be electrochemically reduced and oxidized in a reversible manner, with each molecule of polyimide being able to transfer four electrons in two steps (Fig. 1), accounting for a high specific capacity of the electrodes.

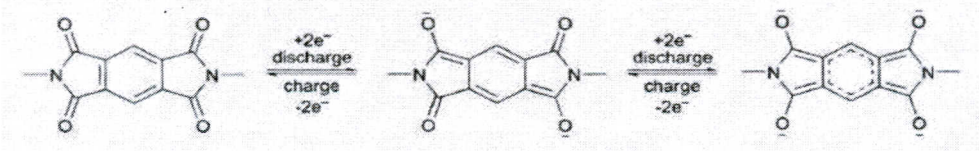

Fig. 1. Electrochemical redox mechanism of polyimides

Some of the composite electrodes studied in this work demonstrated good redox capacity. Results regarding stability assessment by cycling and at constant potential will be presented herein.

Acknowledgements: This work is partially funded by FAI - Projecto REIVE/Redes Eléctricas Inteligentes com Veículos Eléctricos (Smart Vehicle to Grid).

[1] K. Koshikaa, M. Kitajimab, K. Oyaizua, H. Nishide, *Green Chem. Lett. Rev.*, **2009**, *2*, 169.
[2] P. Novak, K. Muller, K. S. V. Santhanam, O. Haas, *Chem. Rev.*, **1997**, *97*, p 207; M. F. Semmelhack, C. R. Schmid, D. A. Cortés, C. S. Chou, *J. Am. Chem. Soc.*, **1984**, *106*, p 3374.