Innovative rocking-chair dual-ion aqueous battery: towards low cost grid storage

Sofia Perticarari[a] , Antonio Jesús Fernández-Ropero[a], Patrick Soudan[a], Montse Casas-Cabanas[c], Dominique Guyomard[a], Bernard Lestriez[a], Fabrice Odobel[b], Philippe Poizot[a] and Joel Gaubicher[a]

[a]*IMN Institut des Matériaux Jean Rouxel, CNRS-Université de Nantes, 2 rue de la Houssiniere, 44322 Nantes Cedex 3, France.*

[b]*CEISAM, Chimie et Interdisciplinarité, Synthèse, Analyse, Modélisation, Université de Nantes, 2, rue de la Houssinière, 44322 Nantes Cedex 3, France*

[c]*CIC energiGUNE, Parque Tecnológico de Álava, Albert Einstein 48, ED.CIC, 01510, Miñano, Spain*

joel.gaubicher@cnrs-imn.fr

Rocking-chair neutral aqueous batteries constitute a novel and promising technology for environmentally friendly grid storage systems as they reduce cost (electrode materials, separator, electrolyte and cell packaging),[1] risk and environmental impact by comparison to other battery technologies, although this is at the expense of energy density.[2] The use of inexpensive, abundant, recyclable and non-toxic organic active materials provides a logical step towards improving both the environmental and economic impact of these systems. Herein, the first ever rocking-chair dual-ion aqueous battery working with a new family of organic negative electrode active materials is demonstrated by means of low cost and highly scalable synthesis route. The negative redox active compounds work with simultaneous uptake and release of both cations and anions, as a result of a synergistic coupling of the two p-type and n-type redox moieties.[3] Such battery demonstrates optimal voltage, extremely fast kinetics, and highly competitive capacity and cyclability in neutral Na^+ (and Mg^{2+}) electrolytes. Moreover, the influence of the electrode thickness on the electrochemical properties of model materials has been studied and ultra-thick electrodes of 200 $mg.cm^{-2}$ (20 $mAh.cm^{-2}$) have been achieved. Several high energy dual-ion aqueous full-cells are under investigation. These findings may well provide a viable option, thus promoting the design of cutting-edge, low-cost aqueous batteries for grid storage.

References:

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