Third Circular

(Primary program and other important information)

http://www.nms-iupac.org

INTRINSICALLY CONDUCTING POLYMERS IN ELECTROCHEMICAL ENERGY TECHNOLOGY - TRENDS AND PROGRESS

R. HOLZE[1] AND Y. WU[2]

[1]*Technische Universität Chemnitz, Institut für Chemie, AG Elektrochemie, D-09107 Chemnitz, Germany*
[2]*New Energy and Materials Laboratory (NEML), Department of Chemistry & Shanghai Key Laboratory of Molecular Catalysis and Innovative Materials Fudan University, Shanghai 200433, P.R. China*
e-mail: rudolf.holze@chemie.tu-chemnitz.de

Keywords: intrinsically conducting polymer, hybrid materials, composites, energy storage

Although polyaniline being the grandfather of conducting polymers has been around for more than hundred years the real story of intrinsically conducting polymers (ICPs) started with the discovery of the extreme changes of electronic conductance of polyacetylene by Shirakawa et al. In particular polymers based on aniline, pyrrole, thiophene and their substituted relatives have attracted huge attention because of fundamental interest in their fascinating properties and many promising applications.
In electrochemical energy technology applications have been suggested in secondary batteries and in fuel cells. The latter application was basically limited to using the ICP as a more or less inert, in some cases depending on the electrode potential conducting support of a catalyst, e.g. finely dispersed platinum. Positive effects have been observed, they may be due to supporting a fine dispersion of catalytically very active particles, there may also be a true synergistic effect.
Our interest is focussed on using ICPs in electrochemical energy storage devices. Initial suggestions to use e.g. polyaniline as an active positive mass have met only limited success. The gravimetric capacity is rather low: Taking into account typical amounts of charge per repeat unit in a polymer data were not better than those previously observed with lead, in addition the stability of the ICP was found to be insufficient.
Recently ICPs have found widespread application in supercaps and lithium ion batteries. In supercaps they are investigated in asymmetric configurations as active masses or as parts of active masses. In lithium ion batteries ICPs are mostly used as components in active masses improving their performance by e.g. reducing or even inhibiting dissolution of V_2O_5 or sulfur suggested as positive mass. In all cases structirung of the obtained products is of utmost importance to obtain masses realizing the particular purpose of the incorporated ICP and to achieve high energy and power density. Numerous examples will be presented and critically discussed.
Acknowledgement: Financial support from the Alexander von Humboldt-Foundation is gratefully acknowledged.