

E1-10 High conjugation length in detergent/conducting polymer complexes

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Polypyrrole (PPy) films electropolymerized in the presence of an anionic detergent, sodium dodecylbenzenesulfonate (SDBS) were investigated. Traditionally, PPy films are polymerized in the presence of inorganic anions. These small anions are able to move in and out of the film as response to the oxidation or reduction of the polymer backbone. The larger amphiphilic DBS anion is, however, expected to be immobilized in the polymer matrix, requiring cations to respond to the redox reactions of the polymer.

The electrochemical and optical behaviour of PPy/DBS complexes prepared and cycled in aqueous media, exhibit marked differences from "traditional" PPy films prepared and cycled in aqueous media. The difference in the shape of the cyclic voltammograms reflects variations in the interactions between the mobile dopant ions and the polymer network acting as host for the insertion of these ions. The PPy/DBS complex shows a much better stability on cycling compared with "traditional" PPy films.

Optical absorption spectra on PPy/DBS complexes show that the polymer backbone has a high degree of perfection in the alternation of single and double bonds - a high conjugation length. The conjugation length of these films approaches that of PPy films carefully prepared in non aqueous media. This should be related to the fact, that PPy films prepared in aqueous media with small inorganic anions always show low conjugation. The long conjugation length of the PPy/DBS complex is confirmed by transferring these films into a non-aqueous electrolyte, where cyclic voltammograms identical to previously prepared highly-conjugated films were obtained. Due to their stability, PPy/DBS complexes can be used in electrochromic (colour changing) devices and in electrochemomechanical devices (artificial muscles).

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