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Abstract

Evaluation of the Electrochromic Response of Polypyrrole in the Presence of CO_2 in the Solution †

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Abstract: The indium tin oxide (ITO)-coated glass was used as a working electrode for electrochemical deposition of conducting polymer polypyrrole (Ppy). Before polymerization, the electrode surface was additionally modified with triethoxymethylsilane (TEMS) to provide better adhesion of polypyrrole to the surface of ITO. The polymerization of Ppy was performed electrochemically, regarding the previous studies. The ionic strength of the solution was supported by $LiClO_4$. Since the dissolved CO_2 in the solution forms weak acid and, thus, the pH of a solution can be slightly changed, the electrochromic response to the pH changes was evaluated. Britton–Robinson buffer (BRB) was used as the model system for an evaluation of the electrochromic response of polypyrrole at different pH values and concentrations of $NaHCO_3$, which was a source of CO_2 in the solution. For the evaluation of the electrochromic response in the presence of CO_2, the double potential step chronoamperometry method was applied and UV-Vis absorption spectra were registered. To gain insight into the charge transfer phenomenon in more detail, the cyclic voltammetry experiments at different glass/$ITO_{(TEMS)}$/Ppy electrode potential sweep rates were performed.

Keywords: conductive polymer; polypyrrole (Ppy); electrochemical polymerization; electrochromic properties

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