

**Electrochemical and Spectroelectrochemical Investigation of Complementary Electrochromic Devices Based on Oxidatively Polymerised 3,4-Ethylene Dioxythiophenes and Electrochemically Deposited Prussian Blue**

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Poly(3,4-ethylene dioxythiophene)s exhibit excellent conducting and electro-optical properties as well as high stability in their oxidised (bleached) state. A possible field of application for these materials are electrochromic devices (ECDs), e.g., for a use in smart shading systems. In the present work, inorganic/organic (hybrid) complementary ECDs of the type [glass/FTO//inorganic counter electrode /hydrophobic electrolyte/organic working electrode//ITO/PET] were assembled. As working electrode materials polymers of 3,4-ethylene dioxythiophene (EDOT) and alkylated derivatives thereof were employed, known to differ in their conductivity, solubility and electrochromic behaviour [1]. The polymer films were prepared by spin coating via moderator controlled in-situ oxidative chemical polymerisation. As counter electrodes, thin, electrochemically deposited Prussian blue (PB) films were chosen. Besides FTO/glass, ITO/PET foils were alternatively used as substrates for PB deposition. In order to attain maximum device performance, the PB capacity was monitored and adapted to the capacity of the polymer films determined beforehand. Both electrodes were attached to each other in their respective coloured states, separated by a novel hydrophobic polymer gel electrolyte based on a mixture of the ionic liquid 1-butyl-3-methyl imidazolium trifluoromethyl sulfonimide, a lithium salt and the polymeric thickener poly(methyl methacrylate). Highly transparent films of this electrolyte material were prepared by different coating methods.

The main objectives of this work were to study the electrochemical (cyclic voltammetry, electrochemical long term cycling) and spectroelectrochemical properties of the hybrid complementary devices and to reveal the effect of monomer alkylation on the electrochromic behaviour.

[1] L. Gronendaal, G. Zotti, F. Jonas, *Synth. Metals* **118** (2001) 105.