MULTICHROMOPHORIC ELECTROCHROMIC POLYMERS TOWARD HIGH CONTRAST NEUTRAL TINT SEE-THROUGH ELECTROCHROMIC DEVICES

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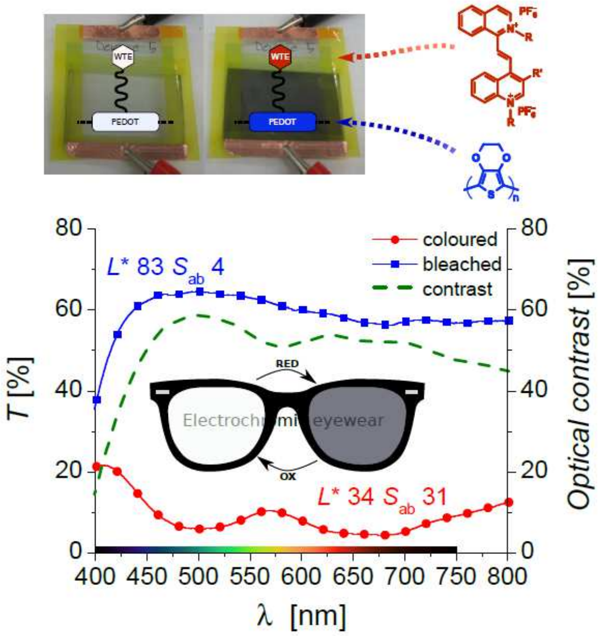
Abstract

Organic electrochromic materials (OEMs) offer a low power input and low cost solution for see-through shading applications (i.e. smart windows, sunglasses). Relevant see-through applications for transmissive ECDs, like sunglasses and automotive, additionally require that the transmitted light experiences negligible colour distortion in both devices limiting states. Donor-Acceptor (DA) polymers concept and all-donor copolymers blends partially addressed this very challenging topic.[1-2] The latter strategy provided brown neutral hues with high bleached state transmissivities (T~70%). These performances are still far from those required to enable a functional assembled electrochromic device (ECD) to compare with existing benchmark technologies (i.e. photochromic lenses). Multichromophoric conjugated polymers (MCPs), are a viable alternative to both DA polymers and polymer blends. These are conjugated polymers (i.e. PEDOT) bearing discrete electrochromic single molecules as side chain substituents acting as contrast enhancers and color tuning additives. Most relevant advantages are an easy synthetic access, colour tunability, superior electrochromic contrast and exceptionally high transmissivity of the colourless state.

We here present the design, synthesis, polymerization and full electrochemical and spectroelectrochemical characterization of a series of new electrochromic MCPs based upon specifically designed DE pertaining to the class of Weitz electrochromes (WTE). The obtained polymeric films are able to reversibly switch between a brown and a colourless limiting states. The superior optical performances combine state-of-the-art lightness contrast with neutral hue, and a unique high lightness colourless state (L^* 94, S_{ab} 2) that make this material an



ideal candidate for application in transmissive ECDs. A proof-of-concept ECD using PB at the counterelectrode show state-of-the-art performance, combining a high lightness low saturation bleached state (L* 83, Sab 4) with a neutral grey hue in the coloured state (L* 34, Sab 31).

References

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