

ELECTROACTIVE POLYMERS AND THEIR DEVICES

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ABSTRACT

Electroactive polymers (EAPs) are smart materials that exhibit controllable response to external stimulus. The brilliant properties of EAPs make it potential in many fields, such as actuators¹, sensors², electrochromic devices³, etc. A less developed and very promising category of applications is that of self-powered electrochromic window (SP-ECW). SP-ECW, which is a combination of electrochromic device and dye-sensitized solar cell, can change its transmittance under illumination without any external voltage. Herein, we report a new self-powered electrochromic window based on an electrochromic polymer, poly(3,4-(2,2-dimethylpropylenedioxy)thiophene) (PProDOT-Me₂) and an organic ruthenium complex dye, N719. By spatially staggering photovoltaic and electrochromic elements in the device, we achieve a transmittance difference of 49.7% between colored and bleached states. The device also shows fast response for coloring and bleaching processes respectively. Electrical energy converted from solar beams can not only be used to drive the device, but also be outputted to the external circuit. SP-ECW has the promising application in vehicles and buildings.

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