DEPARTMENT OF CHEMISTRY & CHEMICAL BIOLOGY

CONJUGATED POLYMERS IN REDOX ACTIVE DEVICES: ELECTROCHROMISM AND CHARGE STORAGE AS CASE STUDIES

PRESENTED BY:

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Conjugated polymers provide a unique encompassing set of structurally tunable optical, electronic transport, and redox properties that allows their present and potential use in a host of applications which span, field effect transistors, light emitting diodes, solar cells and photodetectors, electrochromism, along with batteries and supercapacitors. Processing of these materials is carried out using a variety of solution methods including spin-coating, spray-coating, blade-coating, slot die coating and ink jet printing. In this lecture, we will use the reversible redox switching of electron-rich polymers to demonstrate electrical charge storage, potentially useful in supercapacitor applications.1 The optical absorbance spectra of electron-rich pi-conjugated oligomers and polymers can be tuned to yield electrochromic materials of all colors that can be switched to highly transmissive forms as desired for absorptive/reflective (display type) and absorptive/transmissive (window type) devices. We will demonstrate how structural design and synthesis of fully conjugated polymers, along with mixing in polymer blends, has been used to complete the color palette of electrochromic polymers (ECPs) needed for subtractive color mixing.2 Colorimetric tuning (using the L*a*b* color space) using a combination of electron rich and poor units, in conjunction with employing subtle changes in steric strain or relaxation, allows for the enhancement of the neutral form color vibrancy, and the transmissivity of the oxidized forms. We have developed a set of fast switching, high contrast black and brown ECP blends. We use these brown blends to demonstrate the attractiveness of ECPs in window-type electrochromic devices (ECDs) as active materials in color changing eyewear.3 Finally, we combine our ECP and OPV technologies into possibilities for solar powered electrochromic windows.4