McGill Chemical Society

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Color in Conjugated Polymers: Electrochromism and Photovoltaics

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Otto Maass room 10

Conjugated molecules, oligomers and polymers with intimately interacting donor-acceptor moieties provide light harvesting and electronic energy levels that can be tuned to optimize their utility in electrochromic, along with both bulk heterojunction and dye sensitized solar cell applications. In this presentation, we will explore the combination and interaction of a breadth of electron rich and electron poor species that ultimately allow us to prepare polymer films with band gaps that range from 4 eV in the UV to near 0.5 eV in the infrared. The flexible synthetic chemistry of dioxythiophene-based polymers has allowed us to complete the color palette (yellow, orange, red, purple/magenta/, blue, cyan, green, and black) of vibrantly colored to highly transmissive switching, spray- and blade-coat processed electrochromes of any color, with donor-acceptor interactions especially enabling materials that are black, green and cyan in color. Donor-Acceptor-Donor (DAD) triads with internally fused DA cores provide a means of examining multi-colored chromophores for charge injection to metal oxide electrodes. DA polymers synthesized using a broad selection of co-monomers, provides donor polymers, which, in conjunction with PCBM, yield solar cells with power conversion efficiencies of 7-8%, while providing color control. Combination of multi-layer solution processing allows the construction of solar powered electrochromic windows.