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Carrier-Selective Traps to Control Ambipolar Transport in Conjugated Polymers[1] MICHAEL FORD, JOHN LABRAM, MING WANG, HENGBIN WANG, THUC-QUYEN NGUYEN, GUILLERMO BAZAN, University of California, Santa Barbara — Ambipolar conjugated polymers used for organic field-effect transistors exhibit hole and electron mobilities that approach values relevant for commercial applications. Solution deposition and the wide range of chemical structures that can be tailored to fulfill specific application requirements has generated much interest in this class of materials. However, it has been difficult to control hole and electron transport to obtain high on/off ratios, necessary for efficient complementary circuit elements. By introducing carrier-selective traps (i.e., attenuating either p- or n-type transport while keeping the mobility of the opposite charge carrier largely unperturbed), we are able to effectively "unipolarize" the ambipolar transport. This simple solution-processable method improves the on/off ratios of organic field effect transistors by up to three orders of magnitude. Different polymer semiconductor/additive combinations are offered as examples of generality. Moreover, we demonstrate how the treatment of a given ambipolar polymer yields tailored blends that can be used to fabricate complementary inverters with excellent gain and low-power characteristics.

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