講演会のお知らせ

Title: Dipole layers in organic electronics and as tools for the design of materials

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Abstract

Dipolar layers at interfaces crucially determine the properties of organic electronic devices. As an example, self-assembled monolayers utilizing embedded dipolar entities,[1] can be used to change contact resistances by several orders of magnitude and also allow using the same electrode material for both n- and p-type devices [2].

A deeper insight into the ensuing changes of the electrostatic potential can be gained employing x-ray photoelectron spectroscopy [3], which - for certain materials combinations - can also be used for probing the homogeneity of mixed self-assembled monolayers. [4] Also the charge transport through molecular monolayers is fundamentally changed by polar interfacial layers.[5]

Based on these insights, we suggest to use collective electrostatic effects,[6] which are responsible for the above-mentioned energetic shifts, for designing new materials with unprecedented properties. This strategy is discussed for self-assembled monolayers [1,7], metal-organic frameworks [8], and van der Waals heterostructures.[9] We show that electrostatic design can be used to localize the frontier electronic states in different spatial regions of a materials and shift the energetic positions of the respective electronic states. The resulting control over the nature of electronic states within materials and at interfaces is expected to aid in realizing the promises of organic nano-electronics.

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