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Mixing-Induced Anisotropic Correlations in Molecular Crystalline Systems: Rationalizing the Behavior of Organic Semiconductor Blends KATHARINA BROCH, ANTJE AUFDERHEIDE, JIRI NOVAK, ALEXANDER HINDERHOFER, ALEXANDER GERLACH, RUPAK BANERJEE, FRANK SCHREIBER, Institut fuer Angewandte Physik, Universitaet Tuebingen, Germany — Binary mixtures of organic semiconductors (OSCs) have recently become an important field of research, as they find applications in opto-electronic devices [1]. In these systems, the mixing (intermixing vs. phase separation) and ordering behavior is crucial, since it affects the optical and electronic properties. We present a comprehensive study of binary mixtures of the three prototypical OSCs pentacene (PEN), perfluoropentacene (PFP) and diindenoperlyene (DIP) in all possible combinations [1,2]. Using X-ray reflectivity and grazing incidence X-ray diffraction we investigate the stuctural properties of the mixed films as well as their impact on the optical spectra obtained by spectroscopic ellipsometry. For PEN:DIP we find an anisotropic ordering behavior, comparable to that observed in some liquid crystals, which is fundamentally new for OSCs [2]. The influence of sterical compatibility and the strength of the intermolecular interactions on the mixing and ordering behavior in the different blends will be discussed by extending a conventional mean-field model [1]. Finally, we discuss general rules for the targeted preparation of blends of OSCs. [1] A. Hinderhofer and F. Schreiber, Chem. Phys. Chem., 13, 628 (2012); [2] A. Aufderheide et al., Phys. Rev. Lett., 109, 156102 (2012)

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