Organic semiconductors: The effect of small modifications on device performance

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Abstract: In the search of new high-mobility semiconductors with ambipolar performances, good processability and excellent environmental stability, diverse synthetic strategies have been approached. One of the most widely used consists in the alternation of donor and acceptor moieties in the conjugated skeleton, which allows fine tuning of the frontier molecular orbitals.[1,2] For OTFT applications, low-lying HOMOs are essential to resist air oxidation and thus increase device stability. However, if the HOMO energy is too low, the resulting barrier to hole injection may compromise the transistor performance. Thus, a delicate balance between these two effects is needed. Furthermore, high performance solution-processable materials require the correct selection and positioning of the specific solubilizing substituents in order to achieve proper HOMO and LUMO energy levels, planar molecular conformations, close intermolecular π-π stacking, and proper thin film crystallinity.
In this communication, several examples of molecular and polymeric materials where modifications on their conjugated skeletons, donor/acceptor subunits ratio and/or the selection of proper alkyl solubilizing chains induce noticeable changes in their electronic performances.[1-7]

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