Alloyed organic semiconductors

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Organic semiconductors are useful materials for thin film device applications, such as field-effect transistors and solar cells. Since microstructure and molecular packing of the organic semiconductor film strongly influence charge transport, considerable research effort is devoted to materials processing. One approach to controlling nucleation and growth in organic thin films involves the use of structurally similar additives.[1][2] Although new to organic electronics, this approach has been thoroughly studied by researchers in the crystal growth community, since it is of particular interest for pharmaceuticals.[3]

We report single crystal structures of solid solutions (alloys) of functionalized pentacene derivatives. Blending two structurally similar materials perturbs the packing little. X-ray scattering on solution-cast films reveals a structure for the alloyed materials that is similar to what is observed in the mixed crystals, as well as additional thin film phases. This work demonstrates that structurally similar additives can lead to the formation of substitutional alloys in organic semiconductors.