

Production of Apparatus and Semiconductor Co-Crystal, and a method to enforce face-to-face stacking of organic semiconductors in the solid state that employs semiconductor co-crystal formers (SCCFs), to align semiconductor building blocks (SBBs).

TECH FIELD

Molecular Nanotechnology, Molecular Assemblers, Solid State Organic Synthesis, Organic Field-Effect Transistors, Organic Semiconductors

TECHNOLOGY FEATURES

The invention provides a method to enforce face-to-face stacking of organic semiconductors in the solid state that employs semiconductor co-crystal formers (SCCFs), to align semiconductor building blocks (SBBs). Single-crystal X-ray analysis reveals orbital overlap optimal for organic semiconductor device applications, including such devices as display devices, chips, field-effect transistors, and smart cards.

The invention provides an apparatus comprising: an organic semiconductor co-crystal including a source contact coupled to the organic semiconductor co-crystal, a drain contact coupled to the organic semiconductor co-crystal, and a gate contact coupled to the organic semiconductor co-crystal through an insulative layer.

In another embodiment the invention provides an apparatus comprising: an electronic circuit; and an organic semiconductor co-crystal switch coupled to the electronic circuit. In another embodiment the invention provides a method comprising: forming a thin film including an organic semiconductor co-crystal on a substrate; and forming an active electronic device in the organic semiconductor co-crystal. In another embodiment the invention provides an apparatus comprising: a first electronic device; a second electronic device; and an organic semiconductor co-crystal to couple the first electronic device to the second electronic device.

Relevant Publication: Anatoliy N. Sokolov, Tomislav Friscic, Leonard R. MacGillivray, Enforced Face-to-Face Stacking of Organic Semiconductor Building Blocks within Hydrogen-Bonded Molecular Co-Crystals, J. Am. Chem. Soc., 2006 Mar 8;128(9):2806-7.

BENEFITS OF TECHNOLOGY

The stacking of organic semiconductors of this invention yields a greater p-orbital overlap along with a lower anisotropic resistance perpendicular to the ring system versus other currently used materials.

This allows for stronger intermolecular forces within organic semiconductor lattices which, in turn, suppresses charge carrier scattering by lattice vibrations. Ultimately, the strong intermolecular forces facilitated by the invention enables the creation of tighter semiconductor lattices which would enhance the performance of organic semiconductor solids.

POTENTIAL COMMERCIAL APPLICATIONS

The organic semiconductors of the invention have potential utility in electrical devices, such as organic field-effect transistors, display devices, computer chips, plastic paper, and smart cards

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DEVELOPMENT STATUS:

LAB TESTED

YES

INTELLECTUAL PROPERTY STATUS

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