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Solution Sheared Deposition of Organic Semiconductor Thin-Films with Oriented Crystalline Morphology

Researchers led by Dr. Zhenan Bao in Chemical Engineering at Stanford University have developed a facile, scalable, and general solution shearing process for fabricating organic thin film transistors (OTFT) that deposit highly crystalline, aligned thin films on diverse substrates. The film deposition method allows for control of solvent evaporation while regulating the deposition rate and growth direction of grains in the film. The device performance on shearing processed thin film shows on average over 2-3 times better than those in drop casting or spin coating process.

On-going Research:
Continued research on advanced patterning of solution sheared films

Applications

- Organic Thin Film Transistors (OTFT)
- Next generation displays, devices and consumer electronics

Advantages

- Improved device performance
- General, easy to implement, simple design
- Scalable and compatible with batch and continuous processes
- Useable with a wide array of materials
- Low material requirements
- Deposits continuous or patterned films
- Wide range of working temperatures available

- Mechanical spacers not required but can be used for better control
- No need for special additives or post-processing
- Enhanced film quality that results in better than state-of-the-art performance

Publications

- Z. Liu, H.A. Becerril, M.E. Roberts, Y. Nishi, Z. Bao, *High-Performance Air-Stable Solution Processed Organic Transistors.* 66th IEEE Device Research Conference, June 23-25, 2008.
- H.A. Becerril, M.E. Roberts, Z. Liu, J. Locklin, Z. Bao, *High-Performance Organic Thin-Film Transistors through Solution-Sheared Deposition of Small-Molecule Organic Semiconductors* Advanced Materials, published online 6/2/2008.

Patents

- Published Application: 20100248421
- Issued: 7,855,121 (USA)

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