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器件物理及器件制备技术

去润湿图案化制备TIPS-并五苯有机薄膜晶体管

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摘要: 利用润湿/去润湿的方法配合旋涂工艺制备了图案化的TIPS-并五苯有机半导体薄膜, 制备了顶接触有机薄膜晶体管(OTFTs)。金相显微镜观察发现, 转速的选择对TIPS-并五苯薄膜结晶形貌的影响较大。在1 000~2 000 r/min转速下制备的薄膜完整性好, 结晶区域较大; 而转速增加到3 000 r/min后, 难以获得完整的薄膜且晶粒尺寸变小。电学性能研究得到器件的输出曲线、转移曲线、开关电流比、阈值电压、场效应迁移率, 发现结晶形貌好的器件具有更好的电学性能。1 000 r/min转速下制备OTFT器件最大场效应迁移率为 $5.16 \times 10^{-2} \text{ cm} \cdot \text{V}^{-1} \cdot \text{s}^{-1}$, 电流开关比为 8×10^3 。

关键词: 有机薄膜晶体管 去润湿图案化 电性能

Wetting/Dewetting Patterned TIPS-Pentacene Organic Thin-Film Transistor

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Abstract: Top-contact organic thin-film transistors array was prepared by selectively dewetting of 6,13-Bis(triisopropylsilyl)ethyl) pentacene (TIPS-Pentacene) solution. The optical microscope images showed that the morphology of TIPS-pentacene crystal was influenced by the rotation speed. The TIPS-pentacene thin-films prepared at 1 000~2 000 r/min had good connectivity and large crystal domains. As the rotation speed increased to 3 000 r/min, the patterned film became incomplete and the crystal domain size reduced. The output and transfer curve, on/off current ratio, threshold voltage and field-effect mobility of the device were obtained by electric measurements. The TIPS-pentacene OTFTs prepared at 1 000 r/min had a maximum field-effect mobility of up to $5.16 \times 10^{-2} \text{ cm} \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ and an on/off current ratio of 8×10^3 .

Keywords: organic thin film transistor wetting/dewetting patterned electrical properties

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