

液晶与显示 2012, (3) 313-317 ISSN: CN:

本期目录 | 下期目录 | 过刊浏览 | 高级检索

[打印本页] [关闭]

器件物理及器件制备技术

高性能顶栅结构有机薄膜晶体管

洪飞, 谭莉, 朱棋锋, 向长江, 韩学斌, 张其国, 郭晓东, 申剑锋

中国科学院 上海高等研究院 新型显示技术研究中心, 上海 201210

摘要: 采用六联苯(p-6P)和氧钒酞菁(VOPc)作为有源层材料,利用弱外延生长技术制备有机薄膜晶体管(OTFT)。在相同的工艺条件下制备了顶栅结构(top-gate)和底栅结构(bottom-gate)两种器件构型,发现两种不同结构的OTFT器件特性存在较大的差异,top-gate OTFT的迁移率比bottom-gate OTFT高很多。在顶栅结构的器件构型中获得了较高的器件特性参数,迁移率达到 $1.6 \text{ cm}^2/\text{V} \cdot \text{s}$ 。研究了弱外延生长技术应用在两种不同器件构型中的差异,并解释了顶栅结构OTFT迁移率较高的原因。

关键词: 有机薄膜晶体管 顶栅结构 弱外延 氧钒酞菁

High Performance Organic Thin Film Transistor Based on Top-Gate Configuration

HONG Fei, TIAN Li, ZHU Qi-feng, XIANG Chang-jiang, HAN Xue-bin, ZHANG Qi-guo, GUO Xiao-dong, SHEN Jian-feng

New Display Technology Research Center, Shanghai Advanced Research Institute, Chinese Academy of Sciences, Shanghai 201210, China

Abstract: Organic thin film transistors based on Weak Epitaxy Growth (WEG) technology are fabricated with two different design: top-gate and bottom-gate configurations. The active layer materials of the OTFT are p-6P and vanadyl phthalocyanine (VOPc). The two structural OTFTs are prepared under the same process conditions, and it is found that the device performance is different. The mobility of top-gate OTFT is much higher than that of the bottom-gate OTFT. A high mobility of  $1.6 \text{ cm}^2/\text{V} \cdot \text{s}$  is obtained in the top-gate structure. The differentiation of top-gate and bottom-gate OTFTs is studied by Weak Epitaxy Growth (WEG) technology, and the reasons of higher mobility OTFT based on the top-gate configuration is explained.

Keywords: organic thin film transistor top-gate configuration weak epitaxy growth VOPc

收稿日期 2011-12-27 修回日期 2012-01-16 网络版发布日期

基金项目:

上海市科委科研项目(No. 10dz1100300)

通讯作者:

作者简介:

作者Email:

参考文献:

- [1] 吴为敬, 颜骏, 许志平, 等. IGZO TFT与ZnO TFT的性能比较 [J]. 液晶与显示, 2011, 26(2): 147-153.
- [2] 徐小丽, 刘如, 郭小军, 等. 基于不同TFT技术的AMOLED像素电路仿真分析 [J]. 液晶与显示, 2010, 25(4): 565-568
- [3] Zaumseil Z, Friend R H, Sirringhaus H, *et al.* Spatial control of the recombination zone in an ambipolar light-emitting organic transistor [J]. *Nature Mat.*, 2006, (1): 69-74.
- [4] Crone B, Dodabalapur A, Lin Y Y, *et al.* Large-scale complementary integrated circuits based on organic transistors [J]. *Nature*, 2000, (403): 521-523.
- [5] Someya T, Sekitani T, Kato Y, *et al.* A large-area, flexible pressure sensor matrix with organic field-effect transistors for artificial skin applications [J]. *Proc. Natl. Acad. Sci. USA*, 2004, (101): 9966-9970.
- [6] Kitamura M, Imada T, Arakawa Y, Organic light-emitting diodes driven by pentacene-based thin-film transistors [J]. *Appl. Phys. Lett.*, 2003, 83(16): 3410-3412.
- [7] Kelly T W, Muyres D V, Baude P F, *et al.* High performance organic thin film transistors [J]. *Mat. Res. Soc. Symp. Proc.*, 2003, 771: 169-179.
- [8] Wang H B, Zhu F, Ya D H, *et al.* Weak Epitaxy Growth Affording High-Mobility Thin Films of Disk-Like Organic Semiconductors [J]. *Adv. Mater.*, 2007, 19(16): 2168-2171.
- [9] Wang H B, Song D, Yan D H, *et al.* High mobility vanadyl-phthalocyanine polycrystalline films for organic field-effect transistors [J]. *Appl. Phys. Lett.*, 2007, (90): 253510(1-3).
- [10] 刘向, 刘惠, 薛钰芝. OTS修饰的不同厚度酞菁铜OTFT的研究 [J]. 液晶与显示, 2009, 24(1): 66-70.
- [11] 袁剑锋, 闫东航, 许武. 有机薄膜晶体管阈值电压漂移现象的研究 [J]. 液晶与显示, 2004, 19(3): 168-173.
- [12] 廖燕平, 王军. 有机薄膜晶体管及其集成电路 [J]. 现代显示, 2007, (78): 7-14.
- [13] Lee J, Kim K, Kim J, *et al.* Optimum channel thickness in pentacene-based thin-film transistors [J]. *Appl. Phys. Lett.*, 2003, 82(23): 4169-4171.

本刊中的类似文章

1. 汪梅林, 张其国, 郑永亮, 秦永亮, 郭晓东, 谭莉, 朱棋锋, 韩学斌, 申剑锋. 有机薄膜晶体管阵列面向电子纸像素设计 [J]. 液晶与显示, 2012, 27(1): 38-42
2. 张平; 胡文华; 景亚霓; 唐正宁; 钟传杰. 喷墨印刷制备有机薄膜晶体管及其电路的研究进展 [J]. 液晶与显示, 2010, 25(1): 34-39
3. 洪飞 谭莉 朱棋锋 向长江 韩学斌 张其国 郭晓东 申剑锋. 高性能的顶栅结构有机薄膜晶体管 [J]. 液晶与显示, ( ) : 0-0

