



### 发光学应用及交叉前沿

#### 不同表面修饰制备高性能柔性薄膜晶体管

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**摘要：** 分别采用六甲基二硅胺(HMDS, Hexamethyldisilazane)和聚苯乙烯/氯硅烷复合材料修饰聚乙炔基苯酚(PVP)绝缘层制备了底接触的有机薄膜晶体管并研究了其半导体层的表面形貌和器件的电学性能。原子力显微镜观察发现, 并五苯半导体薄膜在不同的界面修饰上的生长形貌产生了很大变化。在PVP上沉积的并五苯晶粒尺寸都小于150 nm, 经过聚苯乙烯/氯硅烷复合材料和HMDS处理后的PVP表面生长的并五苯晶粒尺寸则分别在200~400 nm和400~600 nm。大尺寸的晶粒能够减小器件沟道内的陷阱浓度, 从而有效地提高电学性能。PVP绝缘层采用聚苯乙烯/氯硅烷和HMDS修饰后, 与未修饰的器件相比迁移率分别提高了58倍和82倍。采用HMDS作为表面修饰层制备柔性OTFT, 并五苯场效应晶体管的关态电流约为 $10^{-9}$  A, 电流的开关比超过 $10^4$ , 最大场效应迁移率约可达 $0.338 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ 。

**关键词：** 并五苯 聚乙炔基苯酚(PVP) 聚苯乙烯(PS) 偏压应力 柔性有机薄膜晶体管

#### 本刊中的类似文章

1. 并五苯场效应发光管机理分析与场效应管制作[J]. 2003, 24(4): 417-420

### Preparation of High-performance Flexible Organic Thin-film Transistor Through Different Dielectric Surface Modification

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**Abstract:** High-performance pentacene organic thin film transistor (OTFT) on the Poly(4-vinylphenol) (PVP) dielectric layers with different modification layers using hexamethyldisilazane (HMDS) and polystyrene/chlorosilane composite has been developed. The effect of the different modification layers on the growth mode of pentacene films and the performance of the OTFT were investigated. The AFM images showed that the morphology of pentacene semiconductor films were affected by the interface modification. The pentacene grains grown on the HMDS modified PVP substrates were in the range of 400~600 nm which were larger than those grown on the polystyrene/chlorosilane and bare PVP substrates with dimension in the range of 200~400 nm and 150 nm, respectively. Large particle size can reduce charge trapping and improve the electrical performance. The field-effect mobility of the polystyrene/chlorosilane modified PVP and the HMDS modified PVP was 58 times and 82 times higher than the bare PVP layers. The flexible device with HMDS modification had a maximum field-effect mobility of up to  $0.338 \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ . The transfer curve showed an on/off current ratio exceeding  $10^4$  with the off-current of about  $10^{-9}$  A.

**Keywords:** pentacene PVP PS bias-stress effect flexible organic thin-film transistor

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