



器件制备及器件物理

超薄EuF₃电极修饰层对有机场效应晶体管性能的提升

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摘要：采用EuF₃薄层修饰低功函数金属Ag源、漏电极，制备了CuPc有机场效应晶体管，研究了不同厚度EuF₃对器件性能的影响。结果表明，EuF₃的厚度由0 nm增至0.6 nm时，接触电阻由 $23.65 \times 10^5 \Omega \cdot \text{cm}$ 减至 $3.86 \times 10^5 \Omega \cdot \text{cm}$ ，使得器件载流子迁移率由 $1.5 \times 10^{-3} \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ 提高到 $4.65 \times 10^{-3} \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ 。UPS测试结果表明，薄层EuF₃在Ag与有机半导体间形成了界面偶极势垒，使源漏电极表面功函数增大，空穴注入势垒降低，Ag电极与有机半导体层界面的接触电阻减小，进而提升了空穴的注入效率。

关键词：场效应晶体管 EuF₃ 修饰层

Improvements of Organic Field-effect Transistors by Introducing An EuF₃ Ultra-thin Film as Modified Layer Electrode

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Abstract: Europium fluoride (EuF₃) was employed to modify the source and drain electrodes in CuPc based OFETs, in which they were fabricated by low work function metal Ag. The Influence of EuF₃ with different thickness on devices was investigated. The contact resistance reduced from $23.65 \times 10^5 \Omega \cdot \text{cm}$ to $3.86 \times 10^5 \Omega \cdot \text{cm}$ as the thickness of EuF₃ increased from 0 nm to 0.6 nm, which lead to an increased field-effect mobility from $1.5 \times 10^{-3} \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$ to $4.65 \times 10^{-3} \text{ cm}^2 \cdot \text{V}^{-1} \cdot \text{s}^{-1}$. The UPS results show that an interfacial dipole potential is formed between the silver electrodes and the organic semiconductor layer. It raises the surface work function of the source and drain electrodes and reduces the hole injection barrier, thus decreases the contact resistance and improves the hole injection efficiency.

Keywords: field effect transistors europium fluoride modified layer

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