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H.R. Karimi-Alavijeh, A. Ehsani

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The effect of metal-buffer bilayer Drain/Source electrodes on the operational stability of the organic field effect transistors

H. R. Karimi-Alavijeh^{1*}, and A. Ehsani²

1. Department of Electrical Engineering, University of Isfahan, Isfahan, Iran.

2. Department of Electrical and Avionics Engineering, Malek- ashtar University of Technology, Isfahan, Iran.

e.mail: h.karimi@eng.ui.ac.ir

Tel: +989139197134

Fax: +983136693336

In this paper, we have investigated experimentally the effect of different drain/source (D/S) electrodes and charge injection buffer layers on the electrical properties and operational stability of a stilbene organic field effect transistor (OFET). The results show that the organic buffer layer of Copper phthalocyanine (CuPc) considerably improves the electrical properties of the transistors, but has a negligible effect on their temporal behavior. On the other hand, inorganic metal-oxide buffer layer of Molybdenum oxide (MoO₃) drastically changes both the electrical properties and operational stability. The functionalities of this metal-oxide tightly depend on the properties of the D/S metallic electrodes. OFETs with Al/MoO₃ as the bilayer D/S electrodes have the best electrical properties: field effect mobility $\mu_{\text{eff}}=0.32 \text{ cm}^2/\text{V}\cdot\text{s}$ and threshold voltage $V_{\text{TH}}=-5 \text{ V}$ and the transistors with Ag/MoO₃ have the longest operational stability. It was concluded that the chemical stability of the metal/metal-oxide or metal/organic interfaces of the bilayer D/S electrodes determine the operational stability of the OFETs.

Keywords: Organic transistors, Operational stability, buffer layers.

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