

## Characteristics of OTFTs with Organic or Organic-inorganic Plasma Polymer Thin Films as Gate Dielectric

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The roadmap of developing microelectronics has a new branch: organic electronics. Organic electronics, which utilizes the electrical properties of organic materials in the active or passive layers, is an emerging technology that has received much attention. In conjunction with today's demands for new materials and devices many technologies have emerged for developing organic electronics and consolidating applications and markets. An organic thin-film transistor is the essential device in this paradigm in addition to organic photodiodes and organic light emitting diodes.

This study made in design and fabrication of organic thin-film transistors (OTFTs) using small-molecule organic semiconductors with pentacene as the active layer with record device performance. In this work OTFT test structures fabricated on polymerized substrates were utilized to provide a convenient substrate, gate contact, and gate insulator for the processing and characterization of organic materials and their transistors. By an adhesion development between gate metal and PI substrate, a PI film was treated using O<sub>2</sub> and N<sub>2</sub> gas. The best peel strength of PI film is about 109.07 gf/mm.

Also, we have studied the electric characteristics of pentacene field-effect transistors with the polymer insulators such as cyclohexane and hybrid (cyclohexane-TEOS). The transistors with cyclohexane gate insulator shows higher field-effect mobility,  $\mu_{\text{FET}} = 0.84 \text{ cm}^2/\text{Vs}$ , and smaller threshold voltage,  $V_{\text{T}} = -6.8 \text{ V}$ , compared with the transistor with hybrid gate insulator.