

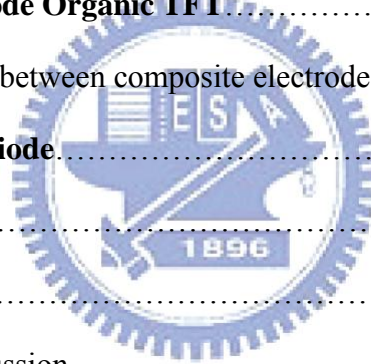
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# High-performance organic thin-film transistors with copper phthalocyanine-modified source/drain contacts

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## ABSTRACT

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The insulator surface treatment transforms the hydrophilic SiO<sub>2</sub> surface to hydrophobic one that is more suitable for organic materials deposition. Organic thin-film transistors (OTFTs) modified by poly( $\alpha$ -methylstyrene) (P $\alpha$ MS) exhibit a high mobility (0.5 cm<sup>2</sup>/Vs) with a high on/off ratio ( $> 10^6$ ).

Copper phthalocyanine (CuPC) has been used as the contact buffer layer to improve the device performance of organic thin-film transistors (OTFTs). By incorporating with 10 nm CuPC, the contact resistance was decreased to 70%, deduced from line-transfer method. The mobility was also improved by 86%. The higher hole current observed in the hole-only diode incorporating with CuPC further confirm the improvement of hole-injection efficiency. Finally, it is inferred that the lower injection barrier is resulted from the induced gap states at the Au/CuPC interfaces.

# 銅苯二甲藍修飾源/汲電極之 高效率有機薄膜電晶體

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## 中文摘要

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二氧化矽介電層，經由自組裝單層表面處理後，從原來的親水性，轉換成適合有機材料成長的疏水性。而經由 PoMS 表面處理後，得到最高  $0.5 \text{ cm}^2/\text{Vs}$  的載子遷移率，以及大於  $10^6$  的整流比。

銅苯二甲藍已經被使用於接面緩衝層以增進高有機薄膜電晶體的元件效能。當置入 10 奈米的銅苯二甲藍於金屬/有機半導體接面，從線性回歸法可得知接面電阻降低了 70%。元件遷移率也增加了 80%。從較高的電洞二極體之電流也可印證置入銅苯二甲藍可改善電洞的注入，我們推測此接面的改善是由於金與銅苯二甲藍能帶間隙中的狀態所致。

# 致謝

此論文的完成，要歸功於許多人的指導以及協助，不管是對於研究內容直接的影響，或是在生活上給我的幫忙，僅以此文代表我的謝意。

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在碩士班兩年的生活中，五個碩二的伙伴們，惠君、思芳、東賢、文生以及永昇，一起組成的『有機電子實驗室拓荒團』，在老師的指導之下，大家一合力把實驗室架構起來，也感謝各位伙伴的幫助，讓我在這兩年的碩士生活中，順利完成研究，也讓我一點都不覺得孤單、無助。

OTFT 組的伙伴，永昇、東賢、映頻、尹婷、紓婷以及泰元，不管在實驗上的合作，或是實驗結果的討論，大家都配合得非常好，在短短的一年內，實驗室的 OTFT 研究從無到有，得到的不只有亮麗的成果，更得到了寶貴的經驗，感謝各位的努力。其他學弟妹，瑞祥、浩偉、上傑、義凱、志力，雖然實驗內容大不相同，但製造了許多實驗室的歡笑，開心的完成實驗。

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# Figure captions

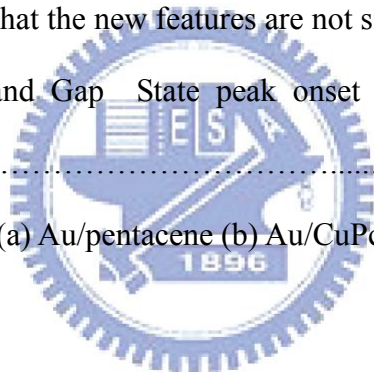
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