

使用矽酸鉛氧化物作為介電層形成可逆光誘導效應之 非揮發性記憶元件

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此論文使用高介電常數之矽酸鉛氧化物薄膜於五苯環有機薄膜電晶體探討其記憶效應；由於矽酸鉛氧化物存在非晶矽以及晶質矽之相分離結構，適合作為電荷陷阱之材料。在電性測量上，藉由修飾層 poly (α -methylstyrene)(P α Ms)薄膜以旋轉塗佈方式於高介電材料上不僅能提升元件電性更增強元件記憶特性。此外，控制負閘極偏壓解釋電荷傳輸以及電荷陷阱之記憶行為；利用光激發之照光方法於正閘極偏壓施加過程中，有效地增加有機薄膜通道上的電荷載子濃度，有助於電荷傳輸並形成可逆式元件；這顯示了在非揮發記憶體元件運用上的光誘導效應對於五苯環有很大的影響。此外，更值得一提的是：單一光波長所產生的釋放電荷正比於五苯環的吸收特性；當有機薄膜對於特定波長有較強的吸收能力時，釋放電荷的速度也隨之增加，尤其是在波長為 670 奈米最為明顯。整體而言，以矽酸鉛氧化物介電層產生的記憶現象擁有顯著的傳導電性、高光敏性的五苯環、以及照光後所產生的鬆弛效應可作為低功率耗損、可饒式、輕薄、低操作電壓、大面積、低成本、資料儲存以及感光性的複寫記憶體元件。

Reversible Photoinduced Effects in Nonvolatile Memory Device Based on Hafnium-silicate Dielectric

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This work describes the memory effect in pentacene-based organic thin-film transistors (OTFTs) with a high-dielectric gate insulator, hafnium silicate, which is a suitable material for the trapped-induced effect due to its dual-phase structure consisting of the amorphous and crystalline regions. Through the electrical measurement, enhanced field-effect as well as memory behaviors were achieved after the modification of the dielectric surface by the spin-coated poly (α -methylstyrene) (P α Ms) thin-film layer. Besides, negative gate bias was related to charge -trapping and -transfer effect that causes a shift of threshold voltage (V_{th}) towards negative direction. With light exposure during the process of positive gate bias, light-induced effect increased the concentration of charge carrier in the conduction channel effectively, and then led to reversible phenomena and rewrite device. There is evident that the photoinduced effect for our non-volatile memory device made a great impact on pentacene

film. It is noteworthy to mention that the released charge generated by light illumination with a single wavelength was directly proportional to the absorption characteristics of pentacene. With the increase of absorption capability, the rate of released charge in pentacene layer was faster, especially at the wavelength of 670 nm. The memory phenomena on hafnium-silicate dielectric with outstanding electrical properties, a reliable high-photosensitivity of pentacene, and relaxation of the illumination effect enable to pave the way for the applications of low-consumption, flexible, lightweight, large-area, low-cost, data-storage, photo-sensitive, and rewrite device.



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時光飛逝！兩年的研究生活即將劃下句點，再多的言語也道不盡心坎中的感受與心情！我的碩士論文衷心感激熱心的師長、學長、朋友幫忙，更添增它的完整性。讓我對有機材料以及製程有更進一步的認識；感激我的指導教授—陳方中老師在實驗上大方地提供研究資源；針對學習疑問給予思考方向；對於做研究的觀點以及想法讓我相當認同；在學術領域上尊重學生的自由；讓我更以嚴肅、謹慎態度來看待實驗以及深信在自己的責任、能力範圍之內可以把實驗完成。做好本分、適度要求的同時，能夠恣意地釋放自己的空間和時間！

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生活中，長輩 成哥、鳳姐、藍老師，好姊妹 幸琪、詠尹，摯友 明仔、啟賢、台謙、子欽、惠玉、凱賢、Joey 等人，一起分享生活點滴；課業上鼓勵和關心；情緒上的傾聽與談心！困難時，給予援手及建議；順遂時，捎來道賀與祝福；在相聚的片刻能夠盡情歡笑，如此幸福！也謝謝室友以及學妹，一起採買、煮火鍋、相約吃飯；分享工作或是課業上的瑣事以及看法，既可愛又搞笑！畢業後的我還是會很懷念這樣的日子！每當回憶起求學生涯的點滴，與其說研究上培養喜愛閱讀論文資料的能力，對於生活中的感觸更為深刻，瞭解在乎的層面問題，**取捨與抉擇！**

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未來的日子裡，期望自己用對的方法做有效率、有意義的工作，讓生活更加豐富化、多元化，珍惜身邊所擁有的人、事、物。轉換心情去處理事情，才有更多進步的空間；用樂觀、灑脫的態度來輕鬆面對；了解不同角度切入的問題與想法。

「Enjoy My Life & Work !」

By Hsiao-Fen Chang

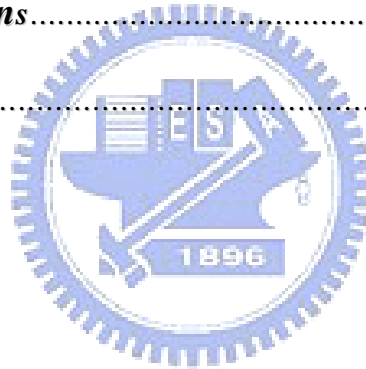
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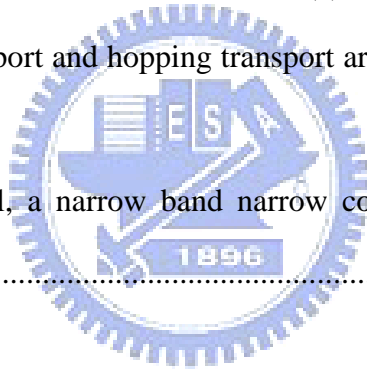
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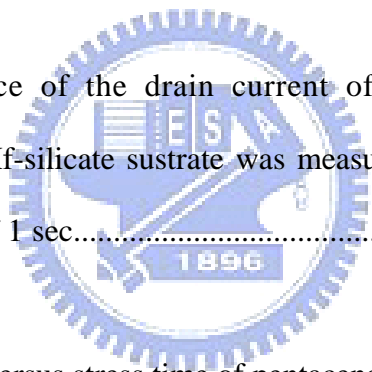


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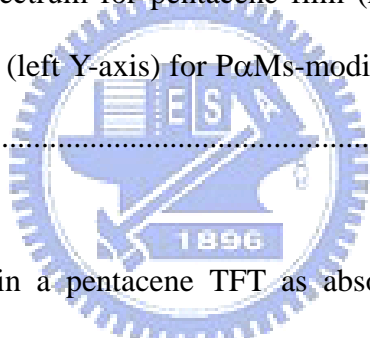
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