

低溫多晶矽薄膜電晶體溫度效應統計性 研究

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摘要

低溫多晶矽薄膜電晶體由於缺陷之故，造成元件有嚴重的特性變動。本論文以統計性的方式探討低溫多晶矽的溫度效應。首先，我們從相同條件的元件製程建立量測資料庫。接著我們從不同元件萃取其傳統參數分析其溫度特性。更進一步的找出它們的趨勢以及分佈。統計性的熱效應有助於我們發展更正確的元件模型。最後我們使用 p 型薄膜電晶體交點電壓傳導機制修正載子移動率模型。這樣新的模型能夠更準確的配適元件特性於不同溫度。

先前關於低溫多晶矽薄膜電晶體的研究中主要著重於元件特性的改良。關於元件特性變動及其影響的問題則很少被討論。然而，在低溫多晶矽薄膜電晶體能被廣泛使用於平面顯示技術前，其元件變動特性必須做進一步的研究。本篇論文中關於元件變動的特性及其影響亦點出了這個問題的重要及必要性。

Statistical Study on Temperature Dependence of Low Temperature Polycrystalline Silicon Thin Film Transistor

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Abstract

LTPS TFTs suffer from serious device characteristic variation due to the number of defects of the polysilicon film. This thesis studies on temperature effect of low temperature poly-silicon thin film transistor (LTPS TFT) with a statistical method. We first establish measurement database from identical device process. Next we extracted typical device parameter to analyze the thermal characteristics from many different devices. Furthermore, we also find the device parameter tendencies and distributions with temperature. This investigation for thermal behaviors statistically is helpful to develop the accurate LTPS TFT model with temperature effects. Finally, we use p-type TFT's cross voltage which concerning the conduction mechanisms of poly-Si TFTs to modify mobility model. A new model is proposed to fit the device transfer characteristics at different temperatures.

Most papers about LTPS TFTs are focusing on the improvement of device performance. However, before LTPS TFTs can be widely used in flat panel displays, the variation of these devices in mass production must be well-controlled. This thesis suggests the importance and necessity of the device variation of the LTPS TFTs.

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