底電極薄膜電晶體研究與分析=research and analysis of undergate tft

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摘 要

摘要 最近，複晶矽薄膜電晶體由於其廣泛應用在印表頭及成像器及平面顯示器上而受到廣泛的注意。傳統上，複晶矽薄膜電晶體有一層絕緣基板及大約12伏特的操作電壓，同時其電特性和複晶矽材料的特性也有極大的關聯。所以，我們不能以傳統上的MOSFET元件模式來描述複晶矽薄膜電晶體元件的操作。到目前為止，很少研究是針對複晶矽薄膜電晶體的元件模式，特別是已發展在MEDICI，TSUPREM4，及AIM-SPICE電路模擬器上的I-V及C-V模式更是付之闕如。最近，部分應用在電路上的低溫複晶矽薄膜電晶體的論文已經發表，但是卻少有論文將溫度效應考慮在電路模式。尤其，更缺乏有關具有溫度效應的複晶矽薄膜電晶體模式建立到商用的電路模擬器上。 本論文嘗試發展一套以物理基礎的複晶矽薄膜電晶體的I-V及C-V模式。首先， 必須發展出一套複晶矽薄膜電晶體的元件模式以及其中參數的萃取方式，參數萃取主要由實驗資料而得，得到之後再帶回所發展德模式中驗證其正確性。所引用的數據主要為一下電極的TFT元件結構，閘極氧化層厚度為1000?，通道長度從1μm到6μm，且是低溫製程。經由上述步驟所得到的模式已放入SPICE電路模擬器中從而預測測及分析複晶矽薄膜電晶體的電路特性。 在本論文中，我們將描述一個模式，此模式應用在次臨界到飽和區間都是可微分且連續，因此是一個非常適用於加入MEDICI，TSUPREM4，AIM-SPICE 電路模擬器。通道長度調變、速度飽和效應、Kink 效應、溫度效應、閘極偏壓誘使晶粒邊界位能降低(GIBL)、汲極偏壓誘使晶粒邊界位能降低(DIBL)、熱載子效應(Hot Carriers Effect)及溫度相依效應將被我們所探討與模式化。

關鍵詞 : 複晶矽薄膜電晶體 ; 通道長度調變 ; Kink 效應 ; 汲極偏壓誘使晶粒邊界位能降低

目錄

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