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全溶液式低驅動電壓氧化鋅銦化合物電晶體穩定性之研究
The Study on the Stability Characteristics of All Solution Process Low Driving Voltage Indium Zinc Oxide Compound Transistors

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中文摘要

本計畫包含了金屬氧化物電晶體(Oxide TFT)的製程、量測與分析，計畫內容以全 溶液式低驅動電壓氣化鋅銦化合物電晶體之穩定性研究為主，降低製程溫度為輔。過去 全溶液製程之氧化電晶體與真空製程之結果相較，有元件特性較差、穩定度不高等問 題。但隨著製程方式與新材料的發展，載子遷移率與穩定度皆有大幅提升。本計畫著重 之重點在於，壓低驅動電壓、提升穩定度與降低製程溫度。茲將其歸納如下項目，(1) 降低驅動電壓，採用溶液式高介電材質，此材料的選擇必須具有高緻密度，製程溫度不 可過高，絕緣性質好，與氧化物匹配等特點，目前鎖定的有氧化釔與氧化鋯等，搭配其 他材質使用堆疊增加其阻抗。(2)摻雜不同氧化電位之金屬離子，穩定氧化鋅化合物中 的氧比例，提升元件之穩定度。(3)採用不同的溶液系統，與不同的製程方式，降低製 程溫度，例如以霧狀喷灑搭配回火，降低至 250°C 將不是問題，要考慮的是降低製程溫 度後元件的穩定性問題。

Abstract

This project focus on the process, measurement and analysis of all solution process and low driving voltage zinc oxide compound transistors. In the past, the solution process oxide transistors had inferior characteristics than the vacuum process oxide transistors due to their loose film structure. Nevertheless, this situation changed, more and more literature reported superior solution oxide transistor characteristics. Thus, the main topics of this program are to lower the driving voltage, increasing its stabilities and lower its manufacture process temperature of solution process zinc oxide transistors. The items are described as below.□ To lower the driving voltage, a solution process high dielectric layer is employed; the YOx and ZrOx would be adopted to increase its gate capacitance and hence lower its operation voltage. (2) Choose different metal system and dope into InZnO TFT, and then observe its characteristics variation with time. (3) Choose an appropriate sol-gel solution system to lower the process temperature for the purpose of flexible electronics applications.