

奈米矽薄膜之製程與特性分析

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摘 要

在本篇論文當中，我們首先透過磁控濺鍍機來成長 SRO/SiO₂ 的多層薄膜結構，後續再經高溫加熱製程來析出矽奈米結晶。透過紅外線光譜儀我們驗證矽奈米結晶的相轉變過程是透過高溫加熱回火所造成，其次是針對不同加熱製程(快速熱回火、爐管以及快速熱退火和爐管)下多層 SRO/SiO₂ 結構分析光激發光與拉曼光譜並加以探討不同加熱製程對於矽奈米結晶狀態的差異，此一結果透露加熱製程若經由快速熱退火接爐管回火會有較佳的結晶效果與結晶體積比例。我們也透過光激發光與拉曼光譜來觀察不同尺寸下 SRO/SiO₂ 多層結構中的矽奈米結晶尺寸。

為了研究 SRO/SiO₂ 多層結構的光伏特效應，我們首先針對元件的電性做量測與分析，緊接著再透過照光去觀察不同尺寸下 SRO/SiO₂ 多層結構的光伏特性。

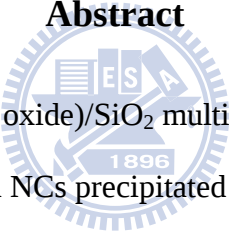
Fabrication and characterization of Si nanocrystals thin films

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Abstract



In this thesis, SRO (silicon rich oxide)/SiO₂ multilayer structure was first grown by magnetron sputtering, and then, Si NCs precipitated through high temperature annealing process. By using Fourier transform infrared spectroscopy (FTIR), we identify the formation of Si NCs due to phase separation after high temperature annealing processes. We also focus on the SRO/SiO₂ structure on different thermal conditions (RTA (Rapid thermal annealing), Furnace and RTA with Furnace), from thermal condition dependence of photoluminescence (PL) and Raman spectra, RTA with furnace annealing might have a better volume fraction of crystallinity. We also analyze the size dependence of PL and Raman spectra to identify the size of Si nanocrystals.

To study the photovoltaic effect, we first focus on the electrical property of SRO/SiO₂ structure, and then we measure the photovoltaic property of SRO/SiO₂ structure under illumination.

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