以N2與CF4電漿前處理催化劑金屬及琪對於SiOx奈米線成長之效應 = Pretreatment of catalyst metal by N2 and CF4 plasma and ...

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摘 要

本實驗在(100)矽基板上蒸鍍一層厚度5nm的鎳金屬催化劑，之後以N2及CF4氣體之電漿對鍍有鎳金屬催化劑之矽基板作前處理，再以SLS機制在溫度 1000 ° C、氬氣流量500sccm的環境下誘發析出矽原子以成長SiOx奈米線。實驗中使用電子顯微鏡(SEM)、能量散佈分析儀(EDS)、霍氏轉換紅外光譜儀(FTIR)及場發射電性的量測，來觀察兩種電漿對於成長SiOx奈米線之影響。數據顯示，隨著電漿射頻功率瓦數的增加，我們可以使鎳金屬催化劑在成核階段形成尺寸較小及數量較多的成核金屬顆粒，而所析出的SiOx奈米線的直徑也會因此較小且數量也會較多。這使得SiOx奈米線場發射點變多。此外，較大的長度與直徑比(aspect ratio)與較小的尖端曲率半徑，也使得場發射的電流密度大增。經過900W的N2電漿前處理後，場發射電流從未處理時的86μA/cm2上升至 1110μA/cm2，而經700W的CF4電漿前處理後，場發射電流上升至2100μA/cm2。然而，過大功率的CF4電漿前處理也會導致催化劑金屬無法成核的現象，造成SiOx奈米線生長上的障礙。實驗數據顯示，700W的CF4電漿前處理對於所生長的SiOx奈米線的場發射特性的增強最為顯著。

關鍵詞 : SiOx奈米線;電漿前處理;場發射;觸媒;矽－鎳合金

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