電漿後處理對SiOx奈米線場發社特性之影響 = The effects of plasma trearments on the field emission characteristics of ...

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摘 要

本研究在(100)矽基板上蒸鍍一層鎳薄膜，在溫度(1000 ° C)、氬氣流量500sccm、成長時間2小時的狀況下誘發析出矽原子以成長SiOx奈米線。本研究針對鎳膜厚度(5nm～25nm)所析出SiOx奈米線的結構性質和電漿處理過後，電流與電場間的關係來進行研究。從SEM圖中發現，典型 SiOx奈米線平均管徑與鎳膜厚度之間呈現幾乎線性的關係。由實驗結果可總結出以下的結論，如果將催化劑鎳膜厚度增大，在成核階段會形成尺寸較大及數量較少的催化劑顆粒，而所析出的SiOx奈米線的直徑也會較大且數量也會較少。由於尖端曲率較小且場發射點較少，因此這些直徑較大且數量較少的SiOx奈米線的場發射電流也會降低。因此，我們必須盡可能使鎳膜厚度縮小，所析出的SiOx奈米線才能獲得不錯的場發射特性。研究發現，雖然典型SiOx奈米線的場發射電流比奈米碳管來得小，但是經過Ar電漿處理後，SiOx奈米線的屏蔽效應會被有效地降低，且頂端的形貌會有所改變，使得電子容易從尖端射出。而經過 CF4電漿處理的SiOx奈米線會產生叢集的現象，因而提高SiOx奈米線的表面密度，且其表面呈現凹凸不平的狀態而增加其場發射點。因此，SiOx奈米線經過電漿後處理可以大幅改善其場發射特性，獲得足以與奈米碳管相比擬的場發射特性。這顯示SiOx奈米線具有作為場發射元件的發展潛力，這與學界普遍的看法並不相同。 關鍵字：SiOx奈米線、場發射、觸媒、矽－鎳合金

關鍵詞 : SiOx奈米線;場發射;觸媒;矽-鎳合金

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