鉻酸與硝酸後處理對熱化學氣相沉積奈米碳管薄膜表面型態與場發社特性之影響 = Effects of nitric acid and chromic acid ...

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摘 要

本實驗利用鉻酸、硝酸以及其混合的化學溶液分別對奈米碳薄膜進行化學純化後處理，以研究其對於奈米碳管後處理的表面形態及場發射特性之影響。本研究的奈米碳管是利用熱化學氣相沉積(thermal chemical vapor deposition)法來成長的。甲烷(CH4)氣體是主要的碳原子來源，而氬氣(Ar)則作為載氣使用。甲烷被觸媒熱分解來獲得碳原子，並從而成長出奈米碳管。我們使用拉曼光譜(Raman spectroscopy)、電子顯微鏡(SEM)、穿透式電子顯微鏡(TEM)、能量散佈分析儀(EDS)來分析經過化學溶液後處理的奈米碳管特性。從實驗數據得知，鉻酸化學溶液對於碳的移除有顯著的效果，而硝酸化學溶液對於催化劑金屬的移除則會有顯著的效果。但是，隨著化學溶液後處理時間的增大，經過蝕刻的奈米碳管本身結構也會遭受到破壞，且奈米碳管數目會變少。另外，從場發射的分析，典型的CNT場發射電流為0.65mA/cm2，經過鉻酸經過化學溶液處理20分鐘的奈米碳管的場發射電流達到8.85mA/cm2，經過硝酸化學溶液處理20分鐘的奈米碳管的場發射電流達到5.59mA/cm2，經過鉻酸—硝酸混合化學溶液處理20分鐘的奈米碳管的場發射電流會達到19.2mA/cm2。因此，使用鉻酸—硝酸混合化學溶液處理奈米碳管，場發射特性會有更顯著的增強效果。

關鍵詞 : 奈米碳管;場發射;熱化學氣相沉積

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