以固態-液態-固態機制成長矽奈米線及鍺奈米線

李麗英、李世鴻

E-mail: 322127@mail.dyu.edu.tw

摘 要

論文中，我們利用金屬當催化劑，以SLS機制成長了矽奈米線及鍺奈米線，並且對奈米線特性及場發射的應用進行了研究。研究過程中，利用掃描式電子顯微鏡(scanning electron microscopy, SEM)及穿透式電子顯微鏡(transmission electron microscopy, TEM)觀察奈米線的表面形態及幾何結構，並使用能量散射光譜儀EDS(electron dispersive spectrometer, EDS)分析奈米線的表面結構與組成成份。此實驗中，矽奈米線以厚度5-25 nm的催化鎳膜在1000°C的成長溫度中成功地被成長出來，並且，鍺奈米線以厚度1-9 nm的催化金膜在550°C-650°C的成長溫度中也成功地被成長出來。從量測結果得知，矽奈米線及鍺奈米線的最小平均直徑分別為38.5 nm 及45.5 nm，兩種奈米線的長度可長達數微米。比較矽奈米線和鍺米奈線的微形態及結構得知，矽奈米線比較長，因此矽奈米線會有比較大的高寬比。顯然，矽奈米線與鍺奈米線的表面型態並不相同。矽奈米線比較彎曲，而鍺奈米線比較筆直。然而，兩種奈米線的表面皆被一層氧化層所環繞，其成分結構分別為SiOx 及GeOx (x

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