Synthesis and Formation Mechanism of SrCO$_3$ Nanowires

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摘要

在溶劑油酸及適量的油酸中熱裂解合成的前驅物油酸鈣(油酸/油酸鈣鈣膜
耳比 0.5–1)可得到不同長度、均一寬度且穩定的正交晶系(空間群為 Pnma)碳酸鈣奈米線(70–300 nm × 5 nm)，反應系統中若未添加油酸則得到結晶度較差
的約 5 nm 的碳酸鈣奈米粒子及由粒子不定向排列聚集形成短的奈米線，但
過量的油酸(油酸/油酸鈣鈣膜耳比大於 2.5)會抑制碳酸鈣晶體的析出。反應過程
顯示系統中過量共存的油酸及油酸的可能形成acht彼得而助於奈米線的形成及
穩定。電子繞射顯示奈米線為單晶的圖譜，長度方向為 a 軸，顯示出奈米
線的定向成長，其製程可以簡化以免除純化前驅物所費的有機溶劑的使用。
碳酸鈣奈米線表面有界面活性劑保護，可作為高分子的填充劑，做成奈米複
合材料。

關鍵詞：碳酸鈣，熱裂解，奈米線
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Abstract

Uniform orthorhombic (space group Pnma) SrCO$_3$ nanowires with size of about 70–300 nm × ~5 nm were synthesized via the thermal decomposition of synthetic precursor strontium oleates (Sr-oleate) in oleylamine with the presence of appropriate amount of oleic acids (oleic acid/Sr-oleate molar ratio 0.5–1). Without the presence of free oleic acid in the synthesis process only give ~5 nm nanoparticles and short nanowires composed of oriented attachment/fusion nanoparticles of SrCO$_3$ with poor crystallinity as products. Excess oleic acid (oleic acid/Sr-oleate molar ratio larger than 2.5) inhibit the present of SrCO$_3$ crystals. The process suggested that the coexistence of oleic acid and oleylamine might form soft templates for the formation and protection of nanowires. The electron diffraction of the nanowires show single-crystal-like diffraction pattern with $a$ axis orientation at the length direction, indicate their order anisotropic growth. The synthesis process might be simplified to avoid the usage of organic solvents in the purification process of the precursor. All the SrCO$_3$ nanowires are protected by the surfactants on the surfaces and should be applied as fillers for polymers in the nanocomposites.

Keywords: strontium carbonate, thermal decomposition method, nanowire