以電泳沉積及燒結改善奈米碳管超級電容器效能之研究

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摘 要

電容器的優點為充放電快速及可瞬間提供較大之負載電流，但缺點為無法提供較大的能量密度，超級電容器的研發即在克服此問題，但目前超級電容器仍有許多問題待解決，其中之一就是老劣化的問題，而這正是本研究的主題。以前的研究直接以鎳觸媒在石墨電極上成長奈米碳管，本研究利用電泳沉積的方式將奈米碳管沉積到石墨電極的表面上。再將沉積奈米碳管石墨電極放入加熱爐管中，在空氣中直接加熱到500°C以上的溫度，希望藉此改善石墨電極超級電容器的老劣化的問題以及增加其電容量。在燒結的試驗中，發現當溫度到達到600°C時，可以有較好的電容效果。本研究測試老劣化的主要方法是三極式循環伏安量測法。藉著電泳沉積奈米碳管，可以讓奈米碳管形成交錯縱橫的微小孔洞結構。除了奈米碳管本身提供的高比表面積外，這些微小孔洞也可以讓電荷進入吸附而增加其電容量。 本研究用硝酸鎂使奈米碳管帶有電性以利電泳沉積之進行，但卻發現鎂離子會造成奈米碳管會在硫酸電解液中呈片狀剝落，必須要將鎂離子移除後，才克服了這個問題。本研究的結果比直接用鎳觸媒在石墨電極上成長奈米碳管好很多，在老劣化方面確有顯著的改善。

關鍵詞 : 奈米碳管;電泳沉積法;超級電容器;老劣化

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