

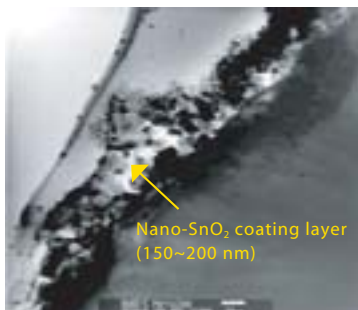
## Nanocomposite Materials for Electrodes of Enhanced Lithium Batteries 高容量鋰電池之奈米複合電極材料

Enhanced performance of Lithium batteries can be realized through suitable modification of electrodes using nanomaterials. ITRI has applied a nanocoating of tin or tin oxide on the graphite anode surface to prevent the graphite sheet exfoliation in the propylene carbonate (PC)-based electrolyte, leading to over 20% increase in reversible energy capacity and improved battery cycle life. On the cathode side, a nanolayer of aluminum or magnesium oxide can stabilize the structure and avoid the desorption of oxygen, thereby reducing the reactivity with electrolytes and improving the overall safety factor. Capacity increase of up to 25% and high discharge rate up to 5C has been demonstrated.

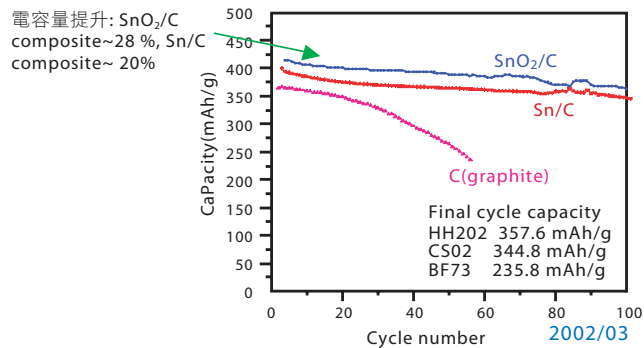
工研院藉由石墨表面奈米複合層改質,提高鋰電池負極材料克電容量,防止石墨表面層膨脹剝落,增加材料在碳酸丙烯(PC)電解液之循環壽命,提升可逆電容量20%;並藉由改善奈米氧化層穩定結構,防止充飽電後氧原子脫離,可降低與電解液的反應性,增加正極材料安全性。克電容量提升25%,充放電速率達5C。

### Technology Achievement

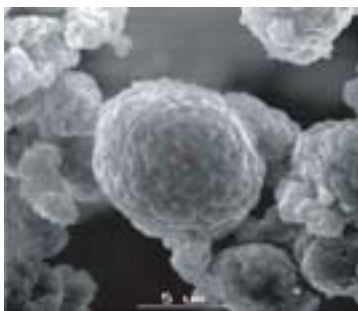
High Energy Capacity Nano Composite Anode Materials: High capacity > 400 mAh/g,  
Low irreversible capacity < 45 mAh/g, High battery energy density > 200 Wh/Kg



2002/03

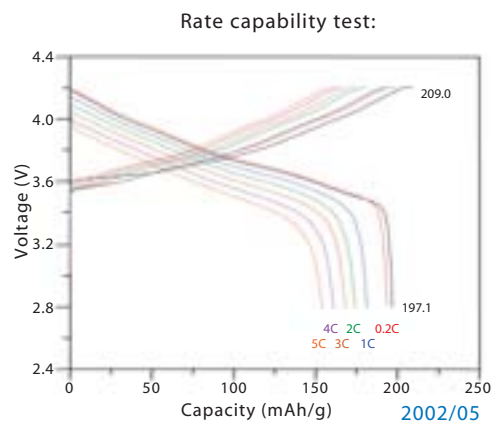


- High Capacity and Safe-cathode materials: High safety (Differential Scanning Calorimetry material exothermic heat < 4.5 W/g, the same with LiCoO<sub>2</sub>), High cathode specific capacity (>180 mAh/g), High discharge rate > 3C rate.



SEM morphology  
超晶粒奈米結構

2002/05



### Applications

These materials are used as the high-capacity electrode materials of high-energy density lithium batteries which are the power sources of notebook PC, cellular phone, camcorder, PDA, digital camera, portable CD player and bluetooth products.