The improved electrochemical properties of silicon thin film anodes using boron doped fullerene C60 as coating material in lithium secondary batteries

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To improve the electrochemical properties of silicon film anode in lithium secondary batteries, the effect of a boron doped fullerene (B/C60) film as a coating material were studied. The B/C60 films were synthesized by plasma assisted evaporation technique using fullerene powder and a gas mixture of argon and di-borane (B2H6). The surface morphology, structural, and electrochemical properties of B/C60 coated silicon anodes were done using scanning electron microscope (SEM), Fourier transform infra red (FTIR) spectroscopy, Raman spectroscopy and charge-disharge tests. FTIR and Raman analyses showed that the boron atoms were successfully doped into the fullerene lattices. Electrochemical measurements revealed that the higher coulombic efficiency and lower irreversible capacity on the first cycle were observed for the B/C60 coated silicon electrodes in comparison with the bare silicon case. Additionally, the stable cyclic property and high capacity retention after the 50th cycle were demonstrated.