

Fast and Scalable Synthesis of Carbon Coated SiNWs by Solvent Free Vapour Growth

Michela OTTAVIANI, Sapienza University of Rome

Silicon represents one of the most attractive candidates as anode in Li-ion batteries have highest theoretical capacity, second most abundant element on the earth crust, low-cost and environmental-friendly material. During the alloying of the Li ions, Si structures experience a very high deformation due to the huge volume expansion (300%) that leads to a rapid degradation of the active materials and failure of the electrochemical performances. Silicon-carbon structure represents a great potential for improving plasticity of the silicon structure and the electronic conductivity. In addition, Nanowires can be easily handled for the volume expansion by using the empty space between the wires. However, the most common techniques for the synthesis of the nanowires use very complex and costly technologies. In this work, we report the fast and scalable synthesis of the silicon NWs by solvent free vapor growth. Cu nanoparticles were deposited on a fiber like carbon substrate using electrodeposition (consume 8 seconds only). A single step growth (20 min) @ 460°C was performed within the vapor phase portion of a glass reactor. A thin carbon layer was deposited on the Nws by using a magnetron sputtering with the aim of improving the electrochemical performances of the active material. The silicon-carbon electrodes were investigated both morphologically and electrochemically.