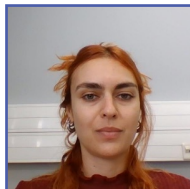


Silicon/Carbon Anodes for Lithium-Ion Batteries



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Lithium ion batteries are one of the most promising energy storage options for devices such as electrical vehicles etc. Silicon (Si) is a premier candidate for next-generation lithium-ion battery anodes due to its exceptional theoretical capacity of ~4200 mAh/g. However, its practical application is hindered by a ~300% volume expansion during lithiation/delithiation, which causes particle pulverization and unstable solid-electrolyte interphase (SEI) formation, leading to rapid capacity decay.

This work presents the controlled synthesis of Si/C yolk-shell nanostructures designed to accommodate this expansion within a protective conductive framework. The methodology involved the surface modification of Si nanoparticles via thermal oxidation to create a SiO₂ sacrificial layer, followed by the polymerization of dopamine at varying intervals. Subsequent carbonization and selective etching of the SiO₂ layer created the required internal void space.

Characterization through Transmission Electron Microscopy (TEM) and X-ray Diffraction (XRD) confirmed the successful formation of the yolk-shell architecture and the retention of silicon's crystallinity. Thermogravimetric Analysis (TGA) demonstrated that polymerization time is critical for controlling carbon content. Preliminary electrochemical testing showed that these yolk-shell materials exhibit enhanced structural stability compared to bare silicon, effectively mitigating pulverization and stabilizing capacity during cycling.

Biography:

Georgia Moysiadou (Chemist) is a Ph.D. candidate in Chemistry at the University of Patras under the foundation of a national scholarship of H.F.R.I and a researcher at the Institute of Chemical Engineering Sciences (FORTH/ICEHT). Also, she has finished a Master at AUTH titled <<Science and Technology of Electrochemical Systems>>. Her research interests are centered on the synthesis, physicochemical, morphological, and electrochemical characterization of anode electrodes for Lithium-Ion batteries. Her work has been communicated through national and international conferences. Additionally, she has participated in national research projects focused on advanced electrochemical systems and material development.