Mesoporous SnO_2 with different morphologies as anode material for lithium ion batteries

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Tin oxide has attracted considerable interests as an alternative anode materials due to its superior theoretical capacity (about 782 $mAhg^{-1}$). However, SnO_2-based materials have the defect from a large volume change (about 300%) during Li^+ alloy and de-alloy process, result in fracture of electrode, loss of electric contact and poor cycling stability. In order to overcome, One strategy to improve cycling stability is fabricating nanostructured electrode which can accommodate the strain of the volume change and also improve rate capability. The reaction with Li ion utilizing nanoscale crystalline wall not only can reduce the diffusion path lengths but also high surface area can provide a high contact area with active frameworks. Control of morphology is valuable for improving performance of Li ion battery. we synthesized ordered meso-SnO_2 with different morphology via nanocating method using morphology controlled SBA-15 as hard template. Rods, sheet, and rice-like shaped meso-SnO_2 materials have similar pore size and wall thickness with hexagonal arrayed mesostructure. This finding helps to understand the morphological effect on capacity fading phenomenon induced from large strain.