Synthesis of Nanostructured Cathode Materials for Li-ion Batteries by Mineralization of Peptide Nanofibers

류정기, 김성욱, 강기석, 박찬범*
KAIST
(parkcb@kaist.ac.kr*)

We report the synthesis of $FePO_4$ nanotubes by biomimetic mineralization of peptide nanofibers, formed by self-assembly of Fmoc-diphenylalanine. The peptide nanofibers were readily coated with $FePO_4$ minerals when sequentially treated with aqueous solutions containing transition Fe^{3+} cations and PO_4^{3-} anions. Detailed investigations revealed that peptide nanofibers were mineralized with amorphous hydrated $FePO_4$. By incubating the peptide/$FePO_4$ core/shell nanofibers at 350 ℃, we could readily fabricate FePO4 nanotubes (average diameter ~20 nm, wall thickness ~5 nm) with inner walls coated with a thin conductive layer of amorphous carbon by carbonization of the peptide core. The novel carbon-coated $FePO_4$ nanotubes were found to be a promising cathode material for rechargeable Li-ion batteries with a very high and reversible Li charge/discharge capacity (approx. 150 mAh g^{-1} at a rate of 10 mA g^{-1}) and negligible capacity fading during cycling.