

One-Dimensional Peptide Nanostructure Templated Growth of Iron Phosphate Nanostructures for Lithium-Ion Battery Cathodes

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Abstract

© 2016 American Chemical Society. Template-directed synthesis of nanomaterials can provide benefits such as small crystalline size, high surface area, large surface-to-volume ratio, and structural stability. These properties are important for shorter distance in ion/electron movement and better electrode surface/electrolyte contact for energy storage applications. Here nanostructured FePO₄ cathode materials were synthesized by using peptide nanostructures as a template inspired by biomineralization process. The amorphous, high surface area FePO₄ nanostructures were utilized as a cathode for lithium-ion batteries. Discharge capacity of 155 mAh/g was achieved at C/20 current rate. The superior properties of biotemplated and nanostructured amorphous FePO₄ are shown compared to template-free crystalline FePO₄.

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Keywords

hydrogel, nanobelt, nanofiber, peptide amphiphile, self-assembly, template-directed materials