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DESIGN AND DEVELOP HIGH PERFORMANCE LIFEPO4/C NANOCOMPOSITES AS CATHODE MATERIALS FOR RECHARGEABLE LITHIUM ION BATTERIES BY CATION EXCHANGE PROCESS

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Nanomaterials, so often reported by claims of delivering multifarious properties, have the genuine potential to make a significant impact on the performance of advanced energy storage and conversion devices (e.g. batteries, super capacitors, fuel cells and solar cells), especially in the high-power aspect, as the reduced dimensions enable far more accessible active surfaces as well as enhanced diffusion dynamics. Herein, we present our detailed work on a novel lithiation of amorphous hydrated $FePO_4$, typically $FePO_4$-PANI (polyaniline) composite, by a facile H^+/Li^+ ion exchange that was attentively deduced and studied with the help of several relevant chemical/physical analytical techniques. The resultant Li-derivative is proved to be a suitable precursor for yielding $LiFePO_4$/C nanocomposite with ideal structural features containing highly crystalline $LiFePO_4$ nanoparticles completely coated with N-doped conductive carbon. More importantly, the $LiFePO_4$/C nanocomposite is capable of offering outstanding electrochemical performances for lithium-ion batteries in terms of high rate capability (~80.3 mAh g-1 at 100) and long-term cyclability (less than 3% discharge capacity loss over 600 cycles at 10) that were strongly supported by the results of cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) tests.

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