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Boosted Crystalline/Amorphous Fe₂O_{3- δ} Core/Shell Heterostructure for Flexible Solid-State Pseudocapacitors in Large Scale

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Abstract

Poor electronic conductivity and sluggish ion diffusion are the two main obstacles that limit the pseudocapacitive performance of Fe₂O₃. In this work, oxygen-deficient Fe₂O_{3- δ} nanorod arrays with a unique crystalline core/amorphous shell heterostructure are prepared via a facile and controllable method. The tunable amorphous layer facilitates the Li⁺ diffusion while introduced oxygen defects in Fe₂O₃ can be effectively tuned to improve electronic conductivity. More importantly, the resultant crystalline/amorphous interface greatly increases charge storage sites for improved specific capacitance. Consequently, the crystalline core/amorphous shell Fe₂O_{3- δ} integrated on graphene delivers a large capacitance of 701 F g⁻¹ (701 mF cm⁻²) at 1 A g⁻¹, which is almost double the capacitance of the conventional Fe₂O_{3- δ} nanorod

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