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Cobaltosic oxide nanocrystals with exposed low-surface-energy planes anchored on chemically integrated graphitic carbon nitride-modified nitrogen-doped graphene: a high-performance anode material for lithium-ion batteries

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A facile strategy to synthesize a composite composed of cubic Co3O4 nanocrystals anchored on chemically integrated g-C3N4-modified N-graphene (CN-NG) as an advanced anode material for high-performance lithium-ion batteries is reported. It is found that the morphology of the Co3O4 nanocrystals contains blunt-edge nanocubes with well-demarcated boundaries and numerous exposed low-index (111) crystallographic facets. These planes can be directly involved in the electrochemical reactions, providing rapid Li-ion transport channels for charging and discharging and thus enhancing the round-trip diffusion efficiency. On the other hand, the CN-NG support displays unusual textural features, such as superior structural stability, accessible active sites, and good electrical conductivity. The experimental results reveal that the chemical and electronic coupling of graphitic carbon nitride and nitrogen-doped graphene synergistically facilitate the anchoring of Co3O4 nanocrystals and prevents their migration. The resulting Co3O4/CN-NG composite exhibits a high specific reversible capacity of up to 1096 mAh g-1 with excellent cycling stability and rate capability. We believe that such a hybrid carbon support could open a new path for applications in electrocatalysis, sensors, supercapacitors, etc., in the near future.

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