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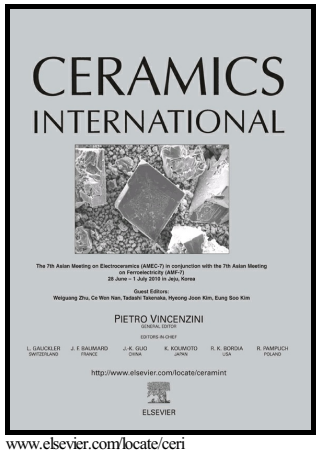

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Carbon nanotubes branch on cobalt oxide nanowires core as enhanced high-rate cathodes of alkaline batteries

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Abstract

Directional synthesis of carbon/metal oxide core-branch arrays is of great importance for development of advanced high-rate alkaline batteries. In this work, we report a facile hydrothermal-chemical vapor deposition (CVD) method for controllable fabrication of Co_3O_4@CNTs core-branch arrays. Interestingly, free-standing Co_3O_4 core nanowires are intimately decorated by cocoon-like branch CNTs with diameters of 20-30 nm, which act as a highly conductive network and structure stabilizer. The electrochemical performance of the designed Co_3O_4@CNTs core-branch arrays are tested as cathodes of alkaline batteries. Arising from enhanced electrical conductivity, larger surface area and improved structural stability, the Co_3O_4@CNTs arrays show superior high-rate electrochemical performance with a higher capacity (116 mAh g^{-1} at 2.5 A g^{-1}), lower polarization and better cycling stability than the pure Co_3O_4 nanowires arrays (76 mAh g^{-1} at 2.5 A g^{-1}). Our directional composite strategy can be extended to preparation of other carbon-based core-branch arrays for applications in electrochemical batteries and catalysis.