Carbon Nanotubes branched on 3D Nitrogen Doped Reduced Graphene Oxide for Lithium Ion Battery Anode

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The growth of carbon nanotubes (CNTs) on three-dimensional nitrogen doped reduced graphene oxide (NG) and formation of nitrogen-incorporated reduced graphene oxide/iron oxide (CNT/NG-Fe) by in-situ formation of iron oxide has been successfully realized via microwave synthesis using NG and iron precursor. Compared with the RGO, the CNTs can be easily grown on the NG due to the good conductivity introduced by the presence of pyrrolic and pyridinic centers. As shown in the electrochemical performances, the discharge capacity of the 3D CNT/NG-Fe is 1208 mAh g-1 at 50 mA g-1 which is greater than 890 and 820 mAh g-1 of the CNT/G-Fe and NG. After 130 cycles at 100 mA g-1, the capacity gradually increases to 1020 mAh g-1 with the Coulombic efficiency of > 98.5 %. The enhanced capacity, rate capability and cyclic stability of the CNT/NG-Fe can be attributed to doping effect of N-configuration and unique hierarchical structure consisting of the dense CNT branches on 3D macroporous continuity.