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苯甲酸修饰碳纳米管的制备及其负载$Co(OH)_2$的电化学电容性能

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摘 要： 以苯甲酸功能化碳纳米管为基底，制备$Co(OH)_2$/苯甲酸化功能化碳纳米管复合材料。苯甲酸官能团在合成过程中发挥了双重作用：既明显改善碳纳米管在去离子水中的分散性，又使得碳纳米管管壁与Co^{2+}表面结合能力大大加强。透射电子显微镜、扫描电子显微镜以及X射线衍射等表征表明，$Co(OH)_2$在碳纳米管上的分散性得到很大改善；电化学实验结果表明，该复合材料拥有优良的电容行为，其比容量在电流密度为5 mA/cm^2时达到322.3 F/g，较$Co(OH)_2$/纯化碳纳米管复合材料以及纯$Co(OH)_2$电极高出100 F/g左右。实验结果表明，以苯甲酸功能化碳纳米管为基底可以进一步有效提高$Co(OH)_2$的利用率。

关键字： 电化学电容器；苯甲酸功能化；碳纳米管；氢氧化亚钴

Preparation and electrochemical capacitive performance of $Co(OH)_2$/benzoic acid functionalized carbon nanotubes

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Abstract: An effective method to synthesize structurally uniform $Co(OH)_2$/f-MWCNTs composite was described by using benzoic acid functionalized MWCNTs as substrate. Benzoic acid group is bifunctional both for solubilizing MWCNTs into deionized water and for tethering Co^{2+} precursor onto MWCNTs surfaces to facilitate the follow-up chemical deposition of $Co(OH)_2$ by supplying surface binding and anchoring sites. The composite has a uniform surface dispersion and large coverage of $Co(OH)_2$ onto f-MWCNTs, which is characterized by XRD, TEM, SEM. Electrochemical tests demonstrate

that the $Co(OH)_2$/f-MWCNTs composite possesses good electrochemical capacitive performance and delivers higher capacity of 322.3 F/g at 5 mA/cm^2, which exceeds about 100 F/g higher than $Co(OH)_2$/p-MWCNTs and pure $Co(OH)_2$. The presented work implies that using f-MWCNTs as substrate is an effective approach to enhance the utilization of $Co(OH)_2$.

Key words: electrochemical capacitor; benzoic acid functionalized; carbon nanotube; cobalt hydroxide