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材料化学工程与纳米技术

氧化铋掺杂纳米二氧化锰/活性炭复合电极

李生娟，王树林，徐波，高慧峰

上海理工大学动力工程学院

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摘要

首次应用机械振动研磨法在室温条件制备纳米活性炭电极材料，经过30 min研磨后，得到了粒度分布在30～50 nm之间的纳米活性炭（nm-AC），研究表明，这种纳米活性炭的结晶性得到了明显增强和改善，且孔径分布更趋于合理。并用溶胶-凝胶方法合成了掺杂氧化铋的纳米二氧化锰（nm-Bi-MnO_2），将其与制备的纳米活性炭制成超级电容器所需的复合电极材料。与10%二氧化锰复合的纳米活性炭电极具有最佳的充放电性能，尤其是在掺杂氧化铋的情况下比电容能量达到308 $F \cdot g^{-1}$ ，且随着电流增大没有显著的衰减。与此同时，用机械振动研磨法将二氧化锰与活性炭的混合物进行研磨改性，电化学分析表明，经机械振动研磨改性的二氧化锰的比电容相对较大，具有进一步提高电极材料性能的潜力。

关键词

纳米活性炭 振动研磨 氧化铋掺杂纳米二氧化锰 溶胶-凝胶法

分类号

Nano-bismuth oxide doped MnO_2/nano-actived carbon as composite electrode materials

LI Shengjuan，WANG Shulin，XU Bo，GAO Huifeng

Abstract

Here we report the preparation of nano-actived carbon (nm-AC) electrode materials with different pore size distributions by roller vibration milling at room temperature. The mechanical vibration milling can obtain nm-AC of 30-50nm, and improve the crystalline of prepared nm-AC. Meanwhile we synthesized nano-bismuth oxide doped MnO_2 by sol-gel methods. Based on a variety of measurements, such as XRD, TEM, AFM, BET, electro-chemical analysis, we experienced the microstructure and the electrochemical performance of the nano-composite electrode materials. Through analysis we found that mixing manganese dioxide materials with nm-AC in optimum weight ratio (10%) may increase the specific capacitance of nm-AC effectively. And the mixed MnO_2 / active carbon raw material was modified by vibration milling. We used the composed nano-actived carbon/MnO_2 electrode materials by vibration milling and sol-gel methods in super-capacitors.

Key words

nano-actived carbon roller vibration milling nano-bismuth oxide doped MnO_2 sol-gel method

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通讯作者 李生娟 lsjmoon@citiz.net;usstshenli@usst.edu.cn