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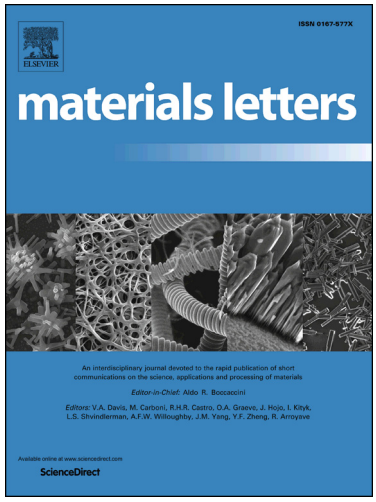

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Synthesis of SnO_2/rGO hybrid materials by sol-gel/thermal reduction method and its application in electrochemical capacitors

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ABSTRACT

The sol-gel method and thermal reduction method were effectively combined to prepare the SnO_2/reduced graphene oxide (rGO) hybrid materials. And an all-solid-state supercapacitor was further fabricated using above materials. The supercapacitor exhibited good electrochemical performance and stability, which showed the SnO_2/rGO hybrid materials may have a wide range of potential applications in electrochemical capacitors. The experimental results indicated that the sol-gel/thermal reduction method was a facile and practical approach, which may offer positive guide and may be applicable for design of the various metal-oxide (MOx)/rGO hybrid materials for capacitor or cell.

Keywords: sol-gel preparation, thermal reduction, hybrid materials, energy storage and conversion

1. Introduction

Graphene is one of the most important raw materials for energy storage and conversion. However, graphene is prone to aggregate owing to the strong π–π interactions and van der Waals force[1, 2]. To overcome these disadvantages, the development and research of MOx/rGO hybrid materials have become one of the most attractive strategies. Among the metal oxide, SnO_2 has attracted considerable attention because of its high capacitance, low cost and low toxicity [3, 4], and has also been widely applied in the field of energy storage. However, the graphene is generally reduced by some poisonous and noxious reagents (such as hydrazine hydrate or haloid acid) for preparation of SnO_2/rGO hybrid materials[5, 6]. The processes are usually complex and the cost is increased. Even if the solvothermal method is applied[7-9], it needs higher pressure and temperature, higher requirement for the equipment, longer treatment time, complicated reprocessing, and so on. In addition, most of the research lays emphasis on