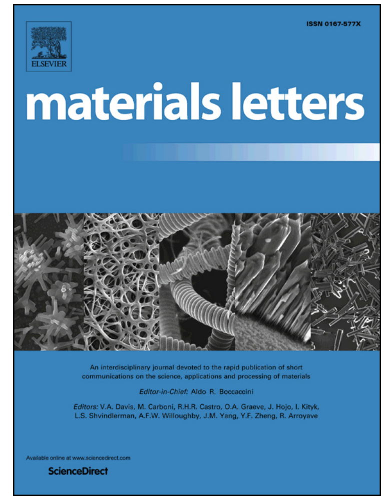

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Low temperature growth of three-dimensional network of graphene for high-performance supercapacitor electrodes

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Abstract

Chemical vapor deposition (CVD) from gaseous hydrocarbon sources has shown great promises for large-scale graphene growth, but the high growth temperature may destroy the metal skeleton. Here we demonstrate a facile CVD route to grow 3D network of graphene on Ni foam at a low temperature of 550℃, adopting camphor as the feedstock. A freestanding graphene network with no binder and high conductivity can be obtained to act as efficient supercapacitor electrodes, exhibiting a high specific capacitance of 390 F/g without combining with any other electroactive materials. This research provides a feasible method for low-cost, high-performance and renewable materials in energy conversion and storage devices.

Key words: low temperature growth; Raman; microstructure; 3D network of graphene; supercapacitor electrodes

1. Introduction

Graphene is a two-dimensional (2D) monolayer of carbon atoms that has received significant attention due to its excellent properties [1,2]. The 2D planar structure of graphene makes it compatible with traditional electronic devices. However, the irreversible stacking of graphene sheets during transferring, severely suppresses its high conductivity and diminishes its surface area [3]. One effective method to tackle this challenge is to construct three-dimensional (3D) graphene networks. The 3D structures provide graphene with high specific surface areas and fast electron transport kinetics due to the combination of 3D porous structures and its excellent intrinsic properties. In addition, the applications of graphene-based materials in energy and biological fields also require assembly of 2D