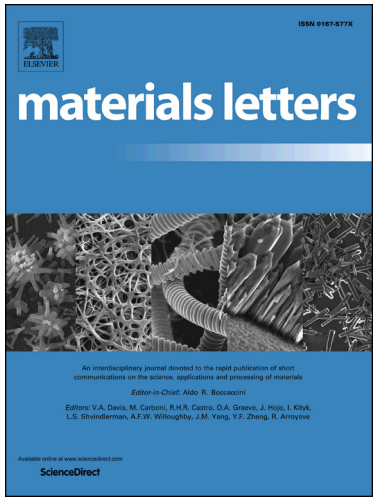

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Achieving Quick Charge/Discharge rate of 3.0 V s^{-1} by 2D Titanium Carbide (MXene) *via* N-doped carbon Intercalation

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Abstract

The MXenes with excellent chemical and physical properties are novel and promising electrode materials for supercapacitors. However, aggregation and restacking of MXene sheets limit material's electrochemical performance. Here, we report a method to prevent MXene sheets from restacking and significantly improved electrochemical capability of $Ti_3C_2T_x$ MXene by intercalating with N-doped carbon (NC) introduced from ZIF-8. $Ti_3C_2T_x$ MXene sheets were prepared by etching Ti_3AlC_2 powder in HF, then ZIF-8/$Ti_3C_2T_x$ composite was prepared, followed by annealing in H_2/Ar atmosphere. Benefited from higher specific surface area and electron conductivity, the obtained NC-$Ti_3C_2T_x$ hybrid shows the quick charge/discharge rate up to 3.0 V s^{-1}, little IR drop at 50.0 A g^{-1}, higher specific capacitance of 82.8 F g^{-1} at 1.0 A g^{-1} (about 210% of the origin), and 100% retention in capacitance after 5000 cycles. This new and effective approach efficiently enhanced the electrochemical performance of $Ti_3C_2T_x$ MXenes and improved them as one of auspicious electrode materials in future energy storage devices.

Keywords

Supercapacitors; MXene; N-doped carbon; Intercalation; Carbon materials; Composite materials

1. Introduction

Among various energy storage systems, supercapacitors, specifically the electric double-