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Gram-scale production of nanoporous graphene by Mg-thermoreduction of CS_2 for electrochemical energy storage

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Abstract

Mass production of porous carbon at low cost for supercapacitor applications is highly desired. Herein, for the first time we report a novel method to grow porous 3D graphene by using Mg to reduce CS_2 vapor. In a tube furnace the mixture of Mg and NaCl powders are heated at 570 °C and reacted with CS_2 vapor carried by an Ar flow. The Mg powder can be about 95% consumed and the weight of resultant carbon nanomaterial is in gram scale after one experiment. This 3D graphene product with specific surface area of 980 cm^2/g is processed into electrodes for electrochemical test, showing a specific capacitance of 212 F/g at 1 A/g in H_2SO_4 aqueous electrolyte. Besides, the electrode is continuously charged/discharged at 5 A/g for 10,000 cycles and its capacitance remains 98.5% of the original value.

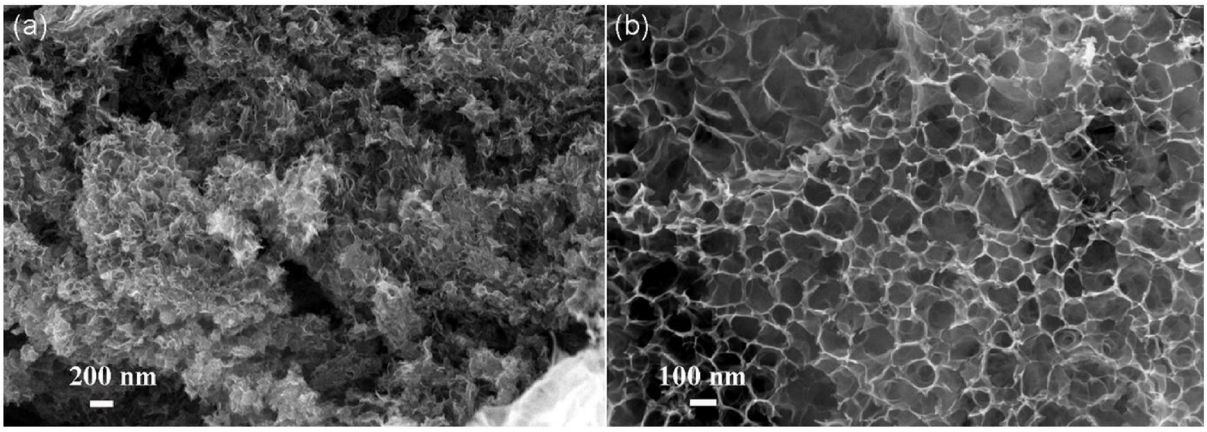

Figure 1. (a) and (b) SEM images of the 3D graphene product at low and high magnifications.