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**Graphene and magnesiated graphene as electrodes for magnesium ion batteries**

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**Abstract**

Herein, for the first time we attempt to use graphene nanoplatelets (GNPs) as a cathode for magnesium ion batteries. We demonstrate a simple electrochemical technique to synthesise GNP-Mg composites and modify its structure using heat treatment ~ 600 °C (H-GNP-Mg). Their structures were evaluated with X-ray diffraction (XRD), scanning electron microscopy (SEM), Raman spectroscopy and elemental distribution determined using energy dispersive spectroscopy (EDX). GNP and H-GNP-Mg cathodes deliver a high specific capacity of ~ 387/170, and 179/165 mAh/g for the 1<sup>st</sup> cycle and 2<sup>nd</sup> cycle, respectively. This work illustrates that GNP's feature high conductivity and surface areas which make them promising cathode candidates for magnesium batteries.

**Keywords:** Carbon materials; Graphene nanoplatelets; Energy storage and conversion; Magnesium battery

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