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In situ Surface Decoration of $Fe_3C/Fe_3O_4/C$ Nanosheets: Towards Bi-functional Activated Carbons with Supercapacitance and Efficient Dye Adsorption

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Abstract

This work reports a bi-functional activated porous carbon (PC) prepared from a biomass tofu, with excellent capacities for charge storage and adsorption of organic dyes, which is enabled by decorating with $Fe_3C/Fe_3O_4/C$ nanosheets. The in-situ growth and self-assembly of the nanosheets on the carbon surface are achieved by a one-step catalytic carbonization of tofu simultaneously with $FeCl_3$ and $ZnCl_2$ catalysts. Due to the high surface area and unique iron compounds-containing and sheet-like structures, the PCs exhibit an electrochemical capacitance of 315 F g^{-1} at 0.5 A g^{-1} as supercapacitor electrodes, and an ultrahigh adsorption capacity of 918 mg g^{-1} for methylene blue (MB) and 868 mg g^{-1} for Rhodamine B (RhB). This study provides a new perspective for understanding the effects of surface engineering on increasing charge storage and dye adsorption ability of biomass-derived PCs as well as for developing bi-functional PCs with novel magnetic properties.

Keywords: Activated carbon; Nanosheets; Supercapacitor; Dye adsorption

1. Introduction

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