Gmail

B. Ramachandra Bhat <brchandra@gmail.com>

Fwd: Your highly cited RSC Advances article

1 message

Shreeganesh Hegde <hegdeshreeganesh@gmail.com> Tue, Mar 11, 2025 at 10:13 AM
To: "Dr.B.Ramachandra Bhat" <brchandra@gmail.com>

---------- Forwarded message ---------
From: **ADVANCES-RSC (shared)** <Advances-rsc@rsc.org>
Date: Fri, 28 Feb, 2025, 4:15 pm
Subject: Your highly cited RSC Advances article
To: hegdeshreeganesh@gmail.com <hegdeshreeganesh@gmail.com>

Dear Colleague,

Many congratulations! Your recent *RSC Advances* publication, Sustainable energy storage: Mangifera indica leaf waste-derived activated carbon for long-life, high-performance supercapacitors (DOI:10.1039/d3ra08910j), is one of our most cited publications from 2024.

Thank you for publishing with *RSC Advances*. We look forward to receiving more of your excellent research in the future.

Sincerely,

Professors Russell Cox and Karen Faulds

Editors-in-Chief, *RSC Advances*

and

Dr Laura Fisher

Executive Editor, *RSC Advances*

Royal Society of Chemistry

www.rsc.org

ROYAL SOCIETY OF CHEMISTRY

RSC Advances

PAPER

View Article Online
View Journal | View Issue

Check for updates

Cite this: *RSC Adv.*, 2024, **14**, 8028

Sustainable energy storage: *Mangifera indica* leaf waste-derived activated carbon for long-life, high-performance supercapacitors†

Shreeganesh Subraya Hegde * and Badekai Ramachandra Bhat *

Received 28th December 2023
Accepted 28th February 2024

DOI: 10.1039/d3ra08910j

rsc.li/rsc-advances

Biomass waste-derived activated carbon has a wide range of applications, including air and water purification, gas separation, energy storage, and catalysis. This material has become increasingly popular in recent years as a result of the growing demand for sustainable and eco-friendly materials. In this study, *Mangifera indica* leaf waste-derived activated carbon has been investigated as an electrode material for high-performance supercapacitors. The dried *Mangifera indica* leaves were first carbonized using $FeCl_3$ and then activated using KOH to increase their surface area and pore structure at different temperatures. The activated carbon prepared at 725 °C has shown a high specific capacitance of 521.65 F g^{-1} at a current density of 0.5 A g^{-1} and also achieved an energy density of 17.04 W h kg^{-1} at a power density of 242.50 W kg^{-1} in the 6 M KOH electrolyte. Significantly, it has demonstrated remarkable electrochemical cycling stability, retaining 96.60% of its initial capacity even after undergoing 10 001 cycles at a scan rate of 500 mV s^{-1}. The superior electrochemical performance of the activated carbon can be attributed to its high surface area of 1232.63 m^2 g^{-1}, well-distributed pore size, and excellent degree of graphitization, which all facilitate the rapid diffusion of ions and enhance the accessibility of the electrolyte to the electrode surface. Hence, this study provides a promising route for utilizing waste biomass as a low-cost, sustainable electrode material for energy storage devices.

1. Introduction

With the overuse and exploitation of fossil fuels like coal and oil, contemporary world civilization has been confronted with a growing number of significant energy problems and environmental degradation.[1,2] Hence, the majority of nations in the world have developed double-carbon policies that made great efforts to create and employ green, renewable resources in order to address the aforementioned issues with sustaining rapid economic development.[3] Recent investigations on the production of activated porous carbon from environmental waste and its usage for various applications have drawn much scientific attention.[4] At the same time, creating new carbon materials with large-scale applications must adhere to industrial requirements such as environmental sustainability, an inexpensive or simple production method, and the disclosure of enhanced or even novel desired features.[5,6] In addition to their superior chemical and thermal stability, the high surface area, variable porosity, and pore sizes of these activated or porous carbons have particularly gained interest.[7] These conditions are satisfied by porous activated carbons made from inexpensive environmental waste precursors, particularly biomass. Most significantly, biomass is ideally suited for the preparation of carbon electrode materials for energy storage devices like supercapacitors due to its extremely high percentage of carbon content and unique physiochemical properties.[8]

Carbon materials are electrically conductive, have a low electrical resistance, a large specific surface area, and can physically adsorb a lot of charges onto their surface. Because of this, supercapacitors made of carbon-based materials frequently have a good specific capacitance, an extended lifespan, and excellent performance stability.[9–12] However, carbon nanotubes, graphene materials, and fullerene are the most appreciated carbon-based electrode materials but typically have complicated synthetic processes and expensive manufacturing costs, making them unsuitable for widespread commercial use.[13] As a result of their simplicity in synthesis, low cost, flexible pore designs, and excellent chemical and thermal stability, porous activated carbon materials show tremendous potential in this respect.[7] Food wastes, municipal solid wastes, agricultural and animal wastes, and other environmental wastes have been widely used in the creation of porous activated carbon through carbonization and activation processes. The characteristics of these porous activated carbons can be regulated by adjusting the activator/carbon precursor ratio, activation

Catalysis and Materials Chemistry Laboratory, Department of Chemistry, National Institute of Technology Karnataka, Surathkal, Mangalore, 575025, Karnataka, India. E-mail: hegdeshreeganesh@gmail.com; ram@nitk.edu.in

† Electronic supplementary information (ESI) available. See DOI: https://doi.org/10.1039/d3ra08910j

