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ABSTRACT BOOK

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Abstract Collection 2025

EXPLORING MUGWORT BIOMASS AS A NOVEL CATALYST SUPPORT FOR GREEN CHEMISTRY

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ABSTRACT

Mugwort (Artemisia vulgaris) is a widely available yet underutilised biomass that holds great promise as a sustainable precursor for catalyst support materials. This study investigates the feasibility of converting mugwort biomass for novel catalyst support in green chemistry applications. The research is motivated by the need to develop renewable, cost-effective, and environmentally benign alternatives to conventional catalyst supports, typically derived from non-renewable, fossil-based sources.

This work's primary objective is to optimise mugwort's conversion into a high-performance activated carbon through controlled carbonisation and activation processes. In this study, mugwort biomass is subjected to pyrolysis under an inert atmosphere at moderate temperatures to initiate carbonisation. Subsequent chemical activation uses appropriate activating agents to enhance the material's surface area, porosity, and surface functionality. These structural characteristics are critical to ensuring effective dispersion and stabilisation of active catalytic species.

A comprehensive physicochemical characterisation of the prepared material is performed using several analytical techniques. The Brunauer-Emmett-Teller (BET) method is employed to determine the surface area and pore size distribution, while X-ray diffraction (XRD) provides insights into the crystalline structure of the carbon matrix. Scanning electron microscopy coupled with energy-dispersive spectroscopy (SEM-EDS) examines the morphology and elemental composition, and thermogravimetric analysis (TGA) assesses the thermal stability.

The catalytic performance of the mugwort-derived activated carbon is evaluated in model reactions, specifically oxidation and hydrogenation, which serve as benchmarks for green chemistry applications. The study further explores modifications of the catalyst support to enhance the interaction between the active phase and the support, thus improving catalytic efficiency and longevity.

This scientific novelty lies in the first systematic exploration of mugwort biomass as catalyst support. The study addresses both environmental and economic challenges associated with conventional catalyst production by repurposing an abundant and renewable resource. This innovative approach promotes waste valorisation and sustainable resource management and aligns with the principles of a circular economy and green chemistry by reducing reliance on synthetic materials.

Preliminary results indicate that mugwort-derived activated materials have a high surface area, well-developed porosity, and favourable chemical properties comparable to traditional catalyst supports. The findings suggest that this material can be tailored for specific catalytic applications with further optimisation, ultimately contributing to cleaner and more sustainable industrial processes.

This research demonstrates that mugwort biomass has significant potential as a novel catalyst support for green chemistry, paving the way for developing eco-friendly catalysts and advancing the sustainable utilisation of biomass resources.

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