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EDITORIAL
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Editorial: High-Performance Catalytic Processes for Biofuel Production

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Editorial on the Research Topic

High-Performance Catalytic Processes for Biofuel Production

Biomass is an abundant and carbon-neutral renewable resource for biofuel production, which has the advantages of sustainability and low cost, and is considered a viable alternative to fossil fuels. To obtain the desired biofuels while reducing greenhouse gas and pollutant emissions, biochemical and thermochemical biomass conversion technologies are used in biomass fuel catalytic processes, such as enzymatic hydrolysis, catalytic pyrolysis/gasification, tar cracking, and biological oil upgrades, etc.

This Research Topic on "*High-performance Catalytic Processes for Biofuel Production*" provides a multidisciplinary, comprehensive, and insightful analysis of the application of high-performance catalysis in biofuel production. Because catalysis plays a crucial role in biofuel production, it selects the right pathway to obtain the desired product and can improve the efficiency, lifetime, selectivity, and cost, etc.

During preparations for this Research Topic, the topic editors sent out 476 invitation letters and received submission responses for 45 manuscripts. Due to time limitations, we were only able to accept six, however, those included here provide support for the research and development of Biofuel Production from different perspectives, including materials and heat transfer. Undertaking in-depth studies, the contributors have made new research progress in the areas described below.

The preparation of biofuel production from plant components has always been a hotspot and focus for related Research. In the article "*Catalytic Conversion of Starch to 5-Hydroxymethylfurfural by Tin Phosphotungstate*," (Hao et al.) researchers explored a series of Brønsted -Lewis acid bifunctional catalysts (Sn_xPW, X = 0.10–0.75) for the conversion of cassava starch to 5-hydroxymethylfurfural (HMF). Among the analyzed catalysts, $Sn_{0.1}PW$ presented the best ability under the test conditions for catalyzing the conversion of starch to HMF. At the optimized conditions of a reaction temperature of 160°C, a catalyst dose of 0.50 mmol/gstarch, and a 1 h reaction time, the starch conversion rate was 90.61%, and the selectivity and yield of HMF were 59.77 and 54.12%, respectively. Findings contribute to the development of HMF production through the dehydration of carbohydrates.

The production of biofuels through catalytic conversion of waste is an important complement to existing biofuel sources. In the article "*Microwave-Assisted Camellia oleifera Abel Shell Biochar Catalyzed Fast Pyrolysis of Waste Vegetable Oil to Produce Aromatic-Rich Bio-Oil*," (Xia et al.) *Camellia oleifera* Abel shell was used as a feedstock to prepare biochar by HNO_3 impregnation and pyrolysis. The biochar was used for the catalytic pyrolysis of waste vegetable oil to prepare bio-oil. The selectivity of the monocyclic aromatic hydrocarbon in the bio-oil was up to 78.82%, and the oxy compound could be completely removed at the catalytic temperature of 600°C. However, the increase in catalyst-to-waste vegetable oil ratio and catalytic temperature decreased the bio-oil yield.

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The electricity converted from biomass fuel is an advantageous supplement to existing energy systems. The Research and development of related electricity storage materials provides promising support for the efficient utilization of biofuel. In the article "*Pore Structure Regulation and Electrochemical Performance Characterization of Activated Carbon for Supercapacitors*," (Li et al.) the effects of carbonization temperature, carbonization time, pre-activation temperature, pre-activation time, and impregnation time on the pore structure of sargassum-based activated carbon (SAC) are studied by orthogonal experiment. SACs show good gravimetric capacitance performance as electrode material for supercapacitors, which can significantly increase the capacitance of supercapacitors and thus broaden their applications. The gravimetric capacitance and specific surface area of SACs show a good linear relationship when the activated carbons have similar material properties and pore size distribution.

As an important element in existing energy consumption, the efficient utilization of biofuel depends on the accurate analysis of the internal relationship of energy system efficiency. The article "*Study on the Impact of Energy Poverty on Energy Efficiency of Construction Industry: Mediating Role of Energy Consumption Structure*,"-(Zhang et al.) using OLS, Tobit, Probit, and other estimation methods, analyzes the internal relationship between energy poverty and the energy efficiency of the construction industry, the mediating role of energy consumption structure, and the moderating effect of technological level and marketization degree. The technological level and the degree of marketization also play a moderating role in the main effects of this research, which can weaken and strengthen the negative impact of energy poverty on the energy efficiency of the construction industry.

Conversion to heat energy is an effective way to utilize biofuel. Studying the heat transfer performance of key structures has played a supporting and helpful role in improving the use of thermal energy in biofuel production. In the article "*Experimental investigation on perturbation length for air-water flow upstream and downstream of U-bends*," (Ma et al.) the perturbation length of vertical U-bend effects on air-water two-phase flow in their adjacent straight tubes were investigated experimentally at ambient pressure and temperature. New dimensionless correlations to predict the influence length of U-bends on the straight tubes upstream and downstream have been given. The prediction errors of 80% of data are within ±30% compared with the present experimental data.

This Research Topic provides a comprehensive analysis of the application of high-performance catalysis in biofuel production. It is expected to be updated with the latest research on efficient and stable catalyst synthesis, process optimization, emission control, and economic analysis.

AUTHOR CONTRIBUTIONS

YG, HL, FG, DW, and XL as Guest Associate Editor in Bioenergy and Biofuels are high-impact researchers and recognized leaders in their field, with a strong publication record in international, peer reviewed journals and with a recognized affiliation. In this SI, they made the contribution to the building of a Review Editorial Board; guiding of a rigorous peer-review process; making the final decision to accept a paper or to recommend it for rejection.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.