Special Issue List in Section

Modeling, Optimization and Control in Algal Biotechnology
Guest Editors: Prof. Dr. Štěpán Papáček; Prof. Dr. Francisco Gabriel Acién Fernández; Prof. Dr. José M. Fernández-Sevilla
Deadline: **20 July 2022**

Waste-to-Energy Processes Using Supercritical Fluids
Guest Editor: Prof. Dr. Francisco Javier Gutiérrez Ortiz
Deadline: **10 August 2022**

Sustainable and Circular Systems for Biofuel Production and Usage
Guest Editor: Dr. Ana Ferreira
Deadline: **31 August 2022**

Innovative Biodegradation Processes for Environmental Contaminants Removal
Guest Editor: Prof. Dr. Annabelle Couvert
Deadline: **31 August 2022**

Anaerobic Digestion: A Holistic Solution to Organic Waste and Contaminants
Guest Editor: Dr. Noori Saady
Deadline: **30 September 2022**

Conception, Modelling, Control, and Intensification of Photobioreactors Applied to the Valorization of Microalgae
Guest Editor: Prof. Dr. Jack Legrand
Deadline: **30 September 2022**

Biomass and Municipal Solid Waste Thermal Conversion Technologies
Guest Editors: Dr. Xiaohan Ren; Prof. Dr. Fei Sun; Prof. Dr. Juan Chen
Deadline: **31 October 2022**

Community-Led Wood-Based Bioenergy Development
Guest Editors: Dr. Nicolas Mansuy; Dr. Ryan Bullock
Deadline: **28 November 2022**

Advances in Biomass Waste Gasification
Guest Editors: Prof. Dr. Enrico Bocci; Prof. Dr. Andrea Di Carlo; Dr. Vera Marcantonio
Deadline: **10 December 2022**

Sustainable Bioenergy Feedstock Production
Guest Editor: Dr. Zdzisława Romanowska-Duda
Deadline: **31 December 2022**

Energy and Matter Recovery from Organic Waste Processing and Reuse Volume 2
Guest Editors: Dr. Anna Grobelak; Dr. Aneta Kowalska
Deadline: **30 January 2023**

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Section Information

In recent decades, there has been a constant growth in the world's energy demands, mostly supported by fossil fuels. This has resulted in an associated increase in CO2 emissions and a growing concern about the consequences of climate change and global warming, which represent a major threat to the wellbeing not only of humankind but also of our planet. Thus, there is an increasing interest in developing new technologies to produce energy from renewable sources, such as biomass, in a high-energy efficient, cost-competitive, and environmentally friendly manner. The production of bio-energy from biofuels offers several advantages, as it will reduce the energy production impact of the greenhouse effect and global warming due to its CO2 life-cycle neutrality; likewise, unlike most other renewable energy sources, bio-energy can generate both heat and electricity with high efficiency in combined heat and power (CHP) plants.

Transport is the third-largest source of CO2 emissions after the power and industrial sectors, with road transport being the biggest contributor followed by aviation and shipping. Reducing the emissions of the transport sector is likely to be more challenging than for other sectors; thus, key developments in the transport sector will have to include higher use of biofuels produced in a sustainable manner, including biojet fuels suitable for aircrafts, in accordance with the sustainable development scenario of the IEA.

The Bio-Energy Section is primarily focused on regular and review papers related to all aspects of bio-energy production and use, including treatment of feedstocks,

Feature Papers

DOI: 10.3390/en13133375

Effect of Additivized Biodiesel Blends on Diesel Engine Performance, Emission, Tribological Characteristics, and Lubricant Tribology

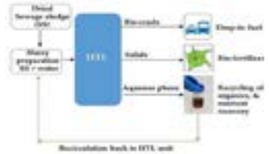
M. A. Mujtaba; H. H. Masjuki; M. A. Kalam; Fahad Noor; Muhammad Farooq; Hwai Chyuan Ong; M. Gul; Manzoore Elahi M. Soudagar; Shahid Bashir; I. M. Rizwanul Fattah; L. Razzaq

Abstract: This research work focuses on investigating the lubricity and analyzing the engine characteristics of diesel–biodiesel blends with fuel additives (titanium dioxide (TiO^2) and dimethyl carbonate (DMC)) and their effect on the tribological properties of a mineral lubricant. A blend of palm–sesame oil was used to produce biodiesel using ultrasound-assisted transesterification. B^30 (30% biodiesel + 70% diesel) fuel was selected as the base fuel. The additives used in the current study to prepare ternary fuel blends were TiO^2 and DMC. $B^30 + TiO^2$ showed a significant reduction of 6.72% in the coefficient of friction (COF) compared to B^30. B10 (Malaysian commercial diesel) exhibited very poor lubricity and COF among all tested fuels. Both ternary fuel blends showed a promising reduction in wear rate. All contaminated lubricant samples showed an increment in COF due to the dilution of combustible fuels. Lub + B10 (lubricant + B10) showed the highest increment of 42.29% in COF among all contaminated lubricant samples. $B^30 + TiO^2$ showed the maximum reduction (6.76%) in brake-specific fuel consumption (BSFC). B^30 + DMC showed the maximum increment (8.01%) in brake thermal efficiency (BTE). B^30 + DMC exhibited a considerable decline of 32.09% and 25.4% in CO and HC emissions, respectively. The $B^30 + TiO^2$ fuel blend showed better lubricity and a significant improvement in engine characteristics.

DOI: 10.3390/en13020493

Bio-Crude Production through Aqueous Phase Recycling of Hydrothermal Liquefaction of Sewage Sludge

Ayaz A. Shah; Saqib S. Toor; Tahir H. Seehar; Rasmus S. Nielsen; Asbjørn H. Nielsen; Thomas H. Pedersen; Lasse A. Rosendahl



Abstract: Hydrothermal liquefaction (HTL) is a promising technology for the production of bio-crude. However, some unresolved issues still exist within HTL, which need to be resolved before its promotion on a commercial scale. The management of the aqueous phase is one of the leading challenges related to HTL. In this study, the sewage sludge has been liquefied at 350 °C with and without catalyst (K^2CO^3). Subsequently, aqueous phase recycling was applied to investigate the effect of recycling on bio-crude properties. Obtained results showed that the energy recovery in the form of bio-crude increased by 50% via aqueous phase recirculation, whereas nitrogen content in the bio-crude was approximately doubled after eight rounds of recycling. GCMS characterization of the aqueous phase indicated acetic acid as a major water-soluble compound, which employed as a catalyst (0.56 M), and resulted in a negligible increase in bio-crude yield. ICP-AES highlighted that the majority of the inorganics were transferred to the solid phase, while the higher accumulation of potassium and sodium was found in the aqueous phase via successive rounds of recycling.

Feature Papers

DOI: 10.3390/en13184686

Cationic Dye Adsorption on Hydrochars of Winery and Citrus Juice Industries Residues: Performance, Mechanism, and Thermodynamics

Nepu Saha; Maurizio Volpe; Luca Fiori; Roberto Volpe; Antonio Messineo; M. Toufiq Reza

Abstract: With the increasing needs of clean water supplies, the use of biomass wastes and residues for environmental remediation is essential for environmental sustainability. In this study, the residues from winery and citrus juice industries, namely grape skin and orange peel, respectively, were first converted to hydrochars by hydrothermal carbonization (HTC) and then a cationic dye (methylene blue) adsorption was studied on hydrochars. Hydrochars from both feedstocks were produced at three different temperatures (180, 220, and 250 °C) and a fixed residence time (1 h) to evaluate the hydrochar's performance on the dye adsorption. The hydrochars were characterized in terms of their pH, pH at point of zero charge (pHPZC), surface functionalities, and surface area. A batch adsorption study of the dye was carried out with variable adsorbate concentration, pH, and temperature. Two adsorption isotherms namely Langmuir and Freundlich models were fitted at 4, 20, and 36 °C. The thermodynamic properties of adsorption (Gibbs free energy (ΔG), enthalpy (ΔH) and entropy (ΔS)) were evaluated from the isotherms fittings. Results showed that the dye adsorption on both hydrochars was significant and followed Langmuir isotherm. The maximum adsorption capacity on citrus waste hydrochar was higher than the winery waste hydrochar at any corresponding HTC temperature. Although hydrochars showed the lowest surface area (46.16 ± 0.11 and 34.08 ± 1.23 m^2/g for citrus and winery wastes, respectively) at 180 °C, their adsorption was the highest, owing to their maximum density of total oxygen functional groups (23.24 ± 0.22 and 32.69 ± 1.39 µmol/m^2 for citrus and winery wastes, respectively), which decreased with the increase in HTC temperature. This research shows a sustainable route for the production of highly effective adsorbent materials at lower HTC temperatures from citrus and winery wastes.

DOI: 10.3390/en13112890

Hydrothermal Carbonization as a Strategy for Sewage Sludge Management: Influence of Process Withdrawal Point on Hydrochar Properties

Fabio Merzari; Jillian Goldfarb; Gianni Andreottola; Tanja Mimmo; Maurizio Volpe; Luca Fiori

Abstract: Conventional activated sludge systems, still widely used to treat wastewater, produce large amounts of solid waste that is commonly landfilled or incinerated. This study addresses the potential use of Hydrothermal Carbonization (HTC) to valorize sewage sludge residues examining the properties of hydrochars depending on HTC process conditions and sewage sludge withdrawal point. With increasing HTC severity (process residence time and temperature), solid yield, total Chemical Oxygen Demand (COD) and solid pH decrease while ash content increases. Hydrochars produced from primary (thickened) and secondary (digested and dewatered) sludge show peculiar distinct properties. Hydrochars produced from thickened sludge show good fuel properties in terms of Higher Heating Value (HHV) and reduced ash content. However, relatively high volatile matter and O:C and H:C ratios result in thermal reactivity significantly higher than typical coals. Both series of carbonized secondary sludges show neutral pH, low COD, enhanced phosphorous content and low heavy metals concentration: as a whole, they show properties compatible with their use as soil amendments.