Selected Special Issues list in Section

Advanced Energy Materials for Thermal Energy Storage Systems
Guest Editor: Prof. Dr. Amritanshu Shukla
Deadline: **15 November 2022**

Composite Phase Change Materials (cPCMs) for Thermal Management Applications
Guest Editors: Dr. Adeel Arshad, Dr. Muhammad Anser Bashir, Dr. Muhammad Imran and Prof. Dr. Jo Darkwa
Deadline: **15 November 2022**

Carbon-Based Materials for Energy Storage Applications
Guest Editor: Dr. Shiqiang Zhuang
Deadline: **21 November 2022**

New Research and Application of Advanced Composite Materials in Energy Applications
Guest Editor: Dr. Suhana Mohd Said
Deadline: **28 November 2022**

Application of Advanced Energy Materials in Building Heat Transfer System
Guest Editors: Prof. Dr. Luisa F. Cabeza, Dr. Emiliano Borri and Dr. Alessio Tafone
Deadline: **30 December 2022**

Estimation of the State-of-Charge and State-of-Health of Lithium-Ion Batteries
Guest Editor: Dr. Domenico Di Domenico
Deadline: **31 December 2022**

Advances in Thermal Energy Storage Materials
Guest Editors: Prof. Dr. Angel G Fernández and Dr. Judith Vidal-Gomez
Deadline: **31 December 2022**

Emerging Materials for Energy Catalysis
Guest Editor: Dr. Junlian Wang
Deadline: **10 January 2023**

New Frontiers in Energy Conversion Materials and Systems for Photovoltaic Cells
Guest Editor: Dr. Soo Min Kim
Deadline: **23 January 2023**

Materials for the Renewable Technologies: Challenges, Opportunities and Recent Advances
Guest Editors: Dr. Maziar Ashuri and Dr. Zhao Ding
Deadline: **31 March 2023**

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Section Information:

The increasing energy demand due to growing global population and the critical relationship between Energy, environment and sustainability lead to novel discoveries and advancement in the field of Energy Materials in search of alternative resources. Energy materials is making ground breaking developments in the science of materials innovation and production. The major significance of Energy helps in strengthening the research and advancement of materials for energy applications. The universal emphasis on energy is to develop materials for energy generation, low energy processing, energy conservation and conversion to meet the increasing energy demand.

Advancing our science and technology, from fundamental breakthroughs in materials and chemistry to improving manufacturing processes, is critical to our energy future. These advances will require a new generation of advanced materials, including:

- Energy and Power Materials
- Structural and Multifunctional Materials
- Electronic and Photonic Materials
- Functional Organic and Hybrid Materials
- Bioderived and Bioinspired Materials

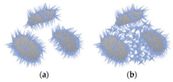
Section Advanced Energy Materials

Featured Papers

DOI: 10.3390/en13246734

Improvement of Strength Parameters of Cement Matrix with the Addition of Siliceous Fly Ash by Using Nanometric C-S-H Seeds

Authors: Bartosz Szostak and Grzegorz Ludwik Golewski

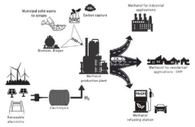


Abstract: Modification of a cement matrix using additives and admixtures has been a common practice for many years. The use of some mineral additives as substitutes for the cement, e.g., the siliceous fly ashes (FAs), has a positive effect on reducing the energy used in cement production. On the other hand, such activities may have negative effects due to the lowering of strength parameters of composites in early stages of curing. In order to solve this problem, over the last few years, thanks to the patented "seedings" technology, a branch of industry connected with the production of admixtures that accelerate the binding process has developed significantly. Therefore, the paper presents the results of research aimed at analyzing the parameters of FA cement matrix with the nanoadmixture containing the nanometric C-S-H seeds (nanoadmixture (NA)). By using the modern NA, an attempt was made to neutralize the negative influence of the used industrial waste on the structure of the cement matrix in the early stages of its curing. The paper presents the results of strength tests for the FA cement pastes modified by NA in seven test periods, i.e., after 8, 12, 24 and 72 h, and 7, 14 and 28 days. Additionally, hydration heat tests were carried out on the analyzed material in the first 24 hours of curing.

DOI: 10.3390/en13030596

A Review of The Methanol Economy: The Fuel Cell Route

Authors: Samuel Simon Araya, Vincenzo Liso, Xiaoti Cui, Na Li, Jimin Zhu, Simon Lennart Sahlin, Søren Højgaard Jensen, Mads Pagh Nielsen and Søren Knudsen Kær

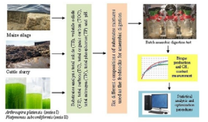


Abstract: This review presents methanol as a potential renewable alternative to fossil fuels in the fight against climate change. It explores the renewable ways of obtaining methanol and its use in efficient energy systems for a net zero-emission carbon cycle, with a special focus on fuel cells. It investigates the different parts of the carbon cycle from a methanol and fuel cell perspective. In recent years, the potential for a methanol economy has been shown and there has been significant technological advancement of its renewable production and utilization. Even though its full adoption will require further development, it can be produced from renewable electricity and biomass or CO_2 capture and can be used in several industrial sectors, which make it an excellent liquid electrofuel for the transition to a sustainable economy. By converting CO_2 into liquid fuels, the harmful effects of CO_2 emissions from existing industries that still rely on fossil fuels are reduced. The methanol can then be used both in the energy sector and the chemical industry, and become an all-around substitute for petroleum. The scope of this review is to put together the different aspects of methanol as an energy carrier of the future, with particular focus on its renewable production and its use in high-temperature polymer electrolyte fuel cells (HT-PEMFCs) via methanol steam reforming.

DOI: 10.3390/en13092186

The effects of Microalgae Biomass Co-Substrate on Biogas Production from the Common Agricultural Biogas Plants Feedstock

Authors: Marcin Dębowski, Marta Kisielewska, Joanna Kazimierowicz, Aleksandra Rudnicka, Magda Dudek, Zdzisława Romanowska-Duda and Marcin Zieliński

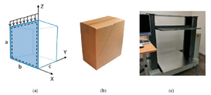


Abstract: The aim of this study was to determine the effects on methane production of the addition of microalgae biomass of *Arthrospira platensis* and *Platymonas subcordiformis* to the common feedstock used in agricultural biogas plants (cattle manure, maize silage). Anaerobic biodegradability tests were carried out using respirometric reactors operated at an initial organic loading rate of 5.0 kg volatile solids (VS)/ m^3, temperature of 35°C, and a retention time of 20 days. A systematic increase in the biogas production efficiency was found, where the ratio of microalgae biomass in the feedstock increased from 0% to 40% (%VS). Higher microalgae biomass ratio did not have a significant impact on improving the efficiency of biogas production, and the biogas production remained at a level comparable with 40% share of microalgae biomass in the feedstock. This was probably related to the carbon to nitrogen (C/N) ratio decrease in the mixture of substrates. The use of *Platymonas subcordiformis* ensured higher biogas production, with the maximum value of 1058.8 ± 25.2 L/kg VS. The highest content of methane, at an average concentration of 65.6% in the biogas produced, was observed in setups with Arthrospira plantensis biomass added at a concentration of between 20%–40% to the feedstock mixture.

DOI: 10.3390/en14041095

Estimation of the Compressive Strength of Corrugated Cardboard Boxes with Various Perforations

Authors: Tomasz Garbowski, Tomasz Gajewski and Jakub Krzysztof Grabski



Abstract: This paper presents a modified analytical formula for estimating the static top-to-bottom compressive strength of corrugated board packaging with different perforations. The analytical framework is based here on Heimerl's assumption with an extension from a single panel to a full box, enhanced with a numerically calculated critical load. In the proposed method, the torsional and shear stiffness of corrugated cardboard, as well as the panel depth-to-width ratio is implemented in the finite element model used for buckling analysis. The new approach is compared with the successful though the simplified McKee formula and is also verified with the experimental results of various packaging designs made of corrugated cardboard. The obtained results indicate that for boxes containing specific perforations, simplified methods give much larger estimation error than the analytical–numerical approach proposed in the article. To the best knowledge of the authors, the influence of the perforations has never been considered before in the analytical or analytical–numerical approach for estimation of the compressive strength of boxes made of corrugated paperboard. The novelty of this paper is to adopt the method presented to include perforation influence on the box compressive strength estimation.