crystals

MDPI

Editorial

Sustainable Composites with Solid Waste Materials

Edyta Pawluczuk [1], Iwona Skoczko [1] and Enrique Fernández Ledesma [2,*]

[1] Faculty of Civil Engineering and Environmental Sciences, Bialystok University of Technology, Wiejska 45A, 15-351 Białystok, Poland; e.pawluczuk@pb.edu.pl (E.P.); i.skoczko@pb.edu.pl (I.S.)
[2] Construction Engineering Area, University of Cordoba, 14014 Cordoba, Spain
* Correspondence: efledesma@uco.es

This Special Issue on "Sustainable Composites with Solid Waste Materials" is a collection of 15 original articles (including one review paper) dedicated to theoretical and experimental research works, providing new insights and practical findings in the field of waste-related topics. The use of waste materials such as fly ash, blast furnace slag, lightweight aggregates, and more can produce compounds to reduce the environmental impact of construction products during their life cycle.

This Special Issue focuses on presenting the results of research into the physical–mechanical, chemical, or microstructural properties of composites with solid waste materials, innovative experimental techniques, and the analytical methods, design, production, and practical applications of these materials. The use of special characterization methods for composite materials such as X-ray diffraction, SEM observation, and thermal analysis is advisable. This will help to protect the environment and improve the durability of composites, thanks to the advanced properties of these wastes.

In terms of more theoretical work, Ren et al. [1] evaluate the purification process, application areas, and the environmental impacts of phosphogypsum waste. Four articles focused on construction and demolition waste applications: Martín et al. [2] established a method to increase the effectiveness of the construction and demolition waste in more resistant mortars, by mixing it with zeolitized cinerite tuff (ZCT) at varying normalized proportions; López-Uceda et al. [3] conducted a statistical analysis of 35 samples and showed that the constituents had a statistically significant influence on the physical–mechanical properties studied; Albuquerque et al. [4] worked with the concrete cover design of recycled aggregate concrete elements exposed to chloride ingress, and they recommend a 5 mm increase in concrete cover as a simple option to ensure that the probability of depassivation due to chloride ingress in recycled aggregate concrete elements is equivalent to analogous natural aggregate concrete elements, and Paula Junior et al. [5] analyzed the influence of recycled concrete aggregates (RCAs) on the development of pervious concrete; its use as a floor covering represents an excellent device to mitigate the urban soil sealing phenomena.

Another group of articles focused on ash studies. Thus, Razzaq et al. [6] study the influence of FA content on the physical, mechanical, and thermal behavior of aluminum–fly ash composites. Gong et al. [7] showed that incorporating fly ash belite cement into Portland cement can shorten the setting time, accelerate hydration reaction speed, enhance the early hydration heat release rate of silicate minerals, and reduce total hydration heat. Moreover, Suarez Macías et al. [8] evaluated the use of biomass bottom ash for the formation of cold in-place recycling with bitumen emulsion. Studies where ash is replaced by cement, such as Ali et al. [9], where they used rice husk ash as a substitute for cement, triggering the strength and durability properties of concrete with 10% rice husk ash. Furthermore, Teixera et al. [10] evaluated biomass fly ash as a cement replacement material or as an alkalinity source in high-volume fly ash mortar and concrete.

Finally, the last group of papers deals with more varied topics, where the following are described:

Citation: Pawluczuk, E.; Skoczko, I.; Fernández Ledesma, E. Sustainable Composites with Solid Waste Materials. *Crystals* **2022**, *12*, 411. https://doi.org/10.3390/cryst12030411

Received: 11 March 2022
Accepted: 15 March 2022
Published: 17 March 2022

- Obtaining renewable energy from the electrochemical oxidation of methanol (Liaqat et al. [11])
- Geopolymer concrete optimized with the Taguchi method (Karthik and Mohan [12])
- Speciation of the heterogeneous oxidation of Cr(III) to Cr (VI) and the surface of the reacted δ-MnO2 (Chen et al. [13])
- Optimization of steel pavement structure and epoxy asphalt (Xu et al. [14])
- Study of the synergistic effect of surfactant and foaming process on the foaming characteristics and rheological properties of foamed bitumen (Lu et al. [15])

We hope that the collection of documents will be to the liking of readers who are looking for new techniques and advances in sustainable composites with solid waste materials, and serve to improve this field of study.

Funding: This research received no external funding.

Acknowledgments: The contribution of all authors and the Crystals Editorial Office is gratefully acknowledged.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Ren, K.; Cui, N.; Zhao, S.; Zheng, K.; Ji, X.; Feng, L.; Cheng, X.; Xie, N. Low-Carbon Sustainable Composites from Waste Phosphogypsum and Their Environmental Impacts. *Crystals* **2021**, *11*, 719. [CrossRef]
2. Martín, D.A.; Costafreda, J.L.; Costafreda, J.L., Jr.; Presa, L. Improving the Performance of Mortars Made from Recycled Aggregates by the Addition of Zeolitised Cineritic Tuff. *Crystals* **2022**, *12*, 77. [CrossRef]
3. López-Uceda, A.; Fernández-Ledesma, E.; Salas-Morera, L.; Jiménez, J.R.; Suescum-Morales, D. Effect of the Composition of Mixed Recycled Aggregates on Physical–Mechanical Properties. *Crystals* **2021**, *11*, 1518. [CrossRef]
4. Albuquerque, A.; Pacheco, J.N.; de Brito, J. Eurocode Design of Recycled Aggregate Concrete for Chloride Environments: Stochastic Modeling of Chloride Migration and Reliability-Based Calibration of Cover. *Crystals* **2021**, *11*, 284. [CrossRef]
5. Paula Junior, A.C.; Jacinto, C.; Oliveira, T.M.; Polisseni, A.E.; Brum, F.M.; Teixeira, E.R.; Mateus, R. Characterisation and Life Cycle Assessment of Pervious Concrete with Recycled Concrete Aggregates. *Crystals* **2021**, *11*, 209. [CrossRef]
6. Razzaq, A.M.; Majid, D.L.; Basheer, U.M.; Aljibori, H.S.S. Research Summary on the Processing, Mechanical and Tribological Properties of Aluminium Matrix Composites as Effected by Fly Ash Reinforcement. *Crystals* **2021**, *11*, 1212. [CrossRef]
7. Gong, Y.; Yang, J.; Sun, H.; Xu, F. Effect of Fly Ash Belite Cement on Hydration Performance of Portland Cement. *Crystals* **2021**, *11*, 740. [CrossRef]
8. Suárez-Macías, J.; Terrones-Saeta, J.M.; Iglesias-Godino, F.J.; Corpas-Iglesias, F.A. Development of Cold In-Place Recycling with Bitumen Emulsion and Biomass Bottom Ash. *Crystals* **2021**, *11*, 384. [CrossRef]
9. Ali, T.; Saand, A.; Bangwar, D.K.; Buller, A.S.; Ahmed, Z. Mechanical and Durability Properties of Aerated Concrete Incorporating Rice Husk Ash (RHA) as Partial Replacement of Cement. *Crystals* **2021**, *11*, 604. [CrossRef]
10. Teixeira, E.R.; Camões, A.; Branco, F.G.; Matos, J.C. Effect of Biomass Fly Ash on Fresh and Hardened Properties of High Volume Fly Ash Mortars. *Crystals* **2021**, *11*, 233. [CrossRef]
11. Liaqat, R.; Mansoor, M.A.; Iqbal, J.; Jilani, A.; Shakir, S.; Kalam, A.; Wageh, S. Fabrication of Metal (Cu and Cr) Incorporated Nickel Oxide Films for Electrochemical Oxidation of Methanol. *Crystals* **2021**, *11*, 1398. [CrossRef]
12. Karthik, S.; Mohan, K.S.R. A Taguchi Approach for Optimizing Design Mixture of Geopolymer Concrete Incorporating Fly Ash, Ground Granulated Blast Furnace Slag and Silica Fume. *Crystals* **2021**, *11*, 1279. [CrossRef]
13. Chen, K.; Bocknek, L.; Manning, B. Oxidation of Cr(III) to Cr(VI) and Production of Mn(II) by Synthetic Manganese(IV) Oxide. *Crystals* **2021**, *11*, 443. [CrossRef]
14. Xu, X.; Gu, Y.; Huang, W.; Chen, D.; Zhang, C.; Yang, X. Structural Optimization of Steel—Epoxy Asphalt Pavement Based on Orthogonal Design and GA—BP Algorithm. *Crystals* **2021**, *11*, 417. [CrossRef]
15. Lu, G.; Zhang, S.; Xu, S.; Dong, N.; Yu, H. Rheological Behavior of Warm Mix Asphalt Modified with Foaming Process and Surfactant Additive. *Crystals* **2021**, *11*, 410. [CrossRef]