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Editorial

Biological Treatment of Organic Waste in Wastewater—Towards a Circular and Bio-Based Economy

Marianna Garfí

Group of Environmental Engineering and Microbiology (GEMMA), Department of Civil and Environmental Engineering, Universitat Politècnica de Catalunya BarcelonaTech (UPC), 08034 Barcelona, Spain; Marianna.garfi@upc.edu

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Due to population growth, accelerated urbanization, and economic development, the quantity of both industrial and urban wastewater generated, and its overall pollution load are increasing globally. In this context, the management of organic waste/sub-products from wastewater is an issue of great concern.

Traditionally, waste has been considered as something that is not useful and has been often neglected over the years. However, the world economic model is currently undergoing a paradigm shift from linear (waste-producing) to circular (waste-to-resources) and bio-based (using renewable biological resources) economies. Thus, there is a need to investigate innovative and cost-effective technologies and processes for the safe and environmentally friendly management of organic waste generated in wastewater treatment systems.

In this context, the biological treatment of organic waste/sub-products from both urban and industrial wastewater is a promising solution to reduce energy and the carbon footprint associated with their treatment and to shift the paradigm from waste treatment to resource recovery.

This Special Issue (SI) focuses on innovative solutions for the biological treatment of organic waste from wastewater. In particular, the research articles included in this SI are related to:

- Process mechanisms and operation, optimization, monitoring, modelling, and applications;
- Removal of pathogens and emerging pollutants;
- Reuse and circular economy;
- Resource recovery (e.g., nutrients recovery, high-value compounds) and energy valorisation (e.g., biogas);
- Life cycle assessment and carbon footprint;
- Tecno-economic assessment and social perception of waste-to-resource processes;
- Low-cost technologies;
- Policy.

Lanko et al. (2021) [1] compared the digestate quality of single-stage mesophilic and thermophilic AD and TPAD systems, in terms of the dewaterability, pathogenic safety and lower calorific value (LCV) and, based on the comparison, consider digested sludge final disposal alternatives. The results showed that TPAD system is the most beneficial in terms of organic matter degradation efficiency.

Mendieta et al. (2021) [2] analyse NCS producers' behavioural intention to use LCB by utilizing an extended technology acceptance model (TAM). This study's findings contribute to research on the TAM and provide a better understanding of the factors influencing NCS producers' behavioural intention to use low-cost digesters.

Lanko et al. (2020) [3] investigated the environmental impact of the anaerobic digestion (AD) of sewage sludge within an activated sludge wastewater treatment plant (WWTP). Three alternative AD systems (mesophilic, thermophilic, and temperature-phased anaerobic digestion (TPAD)) were compared to determine which system may have the best environmental performance. The results showed that the best AD alternative was thermophilic concerning all environmental impact categories, besides climate change and human toxicity.

Kassab et al. (2020) [4] proposed a potential approach for enhanced energy generation from anaerobic digestion; iron-based conductive nanoparticles have been proposed to enhance the methane production yield and rate. The results have shown that supplementing anaerobic batches with NZVIs has an insignificant impact, most probably due to the agglomeration of NZVI particles and, consequently, the reduction in available surface area, making the applied doses insufficient for measurable effect.

Zhang et al. (2020) [5] provided a reference for the application of heterotrophic nitrification-aerobic denitrification in actual wastewater treatment. From the results, the synthetic microbial community was able to simultaneously perform heterotrophic nitrification-aerobic denitrification indicating great potential for full-scale applications.

In conclusion, this SI provided new ways to valorise organic waste from wastewater and describe novel processes, as well as the environmental and social benefits in the frame of the Sustainable Development Goals.

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References

1. Lanko, L.; Hejnic, J.; Říhová-Ambrožová, J.; Ferrer, I.; Jenicek, P. Digested Sludge Quality in Mesophilic, Thermophilic and Temperature-Phased Anaerobic Digestion Systems. *Water* **2021**, *13*, 2839. [CrossRef]
2. Mendieta, M.; Castro, L.; Vera, V.; Rodríguez, J.; Escalante, H. Toward the Adoption of Anaerobic Digestion Technology through Low-Cost Biodigesters: A Case Study of Non-Centrifugal Cane Sugar Producers in Colombia. *Water* **2021**, *13*, 2566. [CrossRef]
3. Lanko, I.; Flores, L.; Garfi, M.; Todt, V.; Posada, J.A.; Jenicek, P.; Ferrer, I. Life Cycle Assessment of the Mesophilic, Thermophilic and Temperature Phased Anaerobic Digestion of Sewage Sludge. *Water* **2020**, *12*, 3140. [CrossRef]
4. Kassab, G.; Khater, D.; Odeh, F.; Shatanawi, K.; Halalsheh, M.; Arafah, M.; van Lier, J. Impact of Nanoscale Magnetite and Zero Valent Iron on the Batch-Wise Anaerobic Co-Digestion of Food Waste and Waste-Activated Sludge. *Water* **2020**, *12*, 1283. [CrossRef]
5. Zhang, Q.; Yang, P.; Liu, L.; Liu, Z. Formulation and Characterization of a Heterotrophic Nitrification-Aerobic Denitrification Synthetic Microbial Community and its Application to Livestock Wastewater Treatment. *Water* **2020**, *12*, 218. [CrossRef]