processes

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Editorial

Reinventing Processes for Sustainability via Process Intensification and Integration

Worapon Kiatkittipong [1,*] and Jun Wei Lim [2,3,*]

[1] Department of Chemical Engineering, Faculty of Engineering and Industrial Technology, Silpakorn University, Nakhon Pathom 73000, Thailand
[2] HICoE-Centre for Biofuel and Biochemical Research, Institute of Self-Sustainable Building, Department of Fundamental and Applied Sciences, Universiti Teknologi PETRONAS, Seri Iskandar 32610, Perak Darul Ridzuan, Malaysia
[3] Department of Biotechnology, Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, Chennai 602105, India
* Correspondence: kiatkittipong_w@su.ac.th (W.K.); junwei.lim@utp.edu.my or jun_wei_85@yahoo.com (J.W.L.)

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A waste material cannot truly be called waste when the procedures and technologies have been invented and developed to exploit and utilize it. In fact, no material should be classified as waste, especially now that various advanced approaches have been created to either recover useful products or convert waste into useful materials for a similar or other application [1]. Accordingly, lifecycle analysis has been employed in the development of various products and the fabrication of new materials in order to ensure that their impacts on the environment are sustainable in nature [2]. Furthermore, modifications and laboratory research are also being performed in order to identify the best resolutions that can offer value to humans and nature via various intensification and integration processes. This can achieve sustainability in waste production and assure that waste will always have its applications. These encompass many industrial activities, as well as sectors such as agriculture, transportation, and mining. Each of these aspects is evolving, and the integration of artificial intelligence (AI) has now begun to increase and enhance the chains' effectiveness, particularly regarding energy consumption [3]. Modelling focused on optimization and prediction has been accepted as the norm for staying abreast of the current developments in tackling the waste issues stemming from inevitable byproduct generation. A fast-moving pace within every sector can only be attained via accurate modelling and the integration of machine learning to ameliorate current processes, enabling more developing countries to shift toward development [4]. Accordingly, in this Special Issue, we intend to present essential advanced technological processes that can be applied in myriad industries in order to develop the key goal of sustainability, moving forward hand-in-hand with the Sustainable Development Goals to reach their targets by 2030 [5]. Readers can learn about the integration and intensification methods that are currently being adopted to capture the carbon stemming from waste gas generation. Novel optimization methods based on modelling, as well as numerical studies, are also reported for industries such as textiles and to forecast local disease outbreaks. Moreover, the potential use of solid organic wastes as nutrients for growing microalgae for the production of protein, carbohydrate, and lipid sources has, evidently, highlighted a major use of waste via bioconversion while avoiding landfill. Besides microalgae, bacteria are also capable of performing the composting of solid organic waste into useful green energy pellets to advocate for a waste-to-energy development plan. The potential of solar energy for process intensification has been integrated into industrial processes to partially offset energy requirements and is gaining traction regarding energy sustainability in the long term. Additionally, the importance of batteries is acknowledged, and various processes to

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recover lithium element from oily wastewater sources are reported. Therefore, this Special Issue, "Reinventing Processes for Sustainability via Process Intensification and Integration" (https://www.mdpi.com/journal/processes/special_issues/Reinventing_Processes, accessed on 19 December 2023), undoubtedly captures every important feature of the advanced processes in intensification and integration for permanent improvements to both human activities and the natural environment.

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