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Editorial

Special Issue on "Advanced Liquid Waste and Gas Waste Treatment Processes"

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The development of industry and increasing population result in the growing demand for clean water and air, with higher and higher volumes of sewage and post-process air to be treated. Despite the high level of wastewater and air treatment methods, it is necessary to constantly develop and improve the available purification techniques. This is why Processes Special Issues on Advanced Liquid Waste and Gas Waste Treatment Processes has been devoted to the latest developments in the fields of air and water treatment.

Fourteen articles were published in the SI, with one review paper and thirteen research articles. Nine of the articles deal with wastewater treatment issues, and five papers cover air pollution-related aspects. The first of the published articles investigates the equilibrium and kinetics of removal of 2,4,6-trichlorophenol from aqueous solutions using biosorption with untreated agro-waste, i.e., pine cone powder [1]. Selected biosorption factors, including agitation time, biomass concentration or pH, were examined. Pine cone powder proved to be a cost-effective biosorbent for the removal of trichlorophenol from wastewater. Removal of phenolic compounds from wastewater was also studied in another paper published in the Special Issue. Liu, Zhang and Song [2] studied the degradation of bisphenol A using a Fenton method. The investigations resulted in the successful preparation of a catalyst, i.e., Fe_3O_4@B-rGO, showing a positive effect of doping boron atoms on the heterogeneous photo-Fenton catalytic activity.

The sonocatalytic performance of SCN/$CoFe_2O_4$ nanocomposite for degrading organic dyes contained in the wastewater was studied by Kamal and co-workers [3]. The paper proved that the synthesized sonocataylst could be regarded as a low-cost and green means for enhancing the degradation of organic pollutants, with the potential to be reused for several runs of wastewater treatment.

Two papers published in the Special Issue investigated the problem of treating wastewater generated during metals processing, however, with different scopes and methods. Rybarczyk and Kawalec-Pietrenko [4] investigated the simultaneous removal of aluminum, copper and zinc from dilute aqueous solutions using ion and precipitate flotation methods. Effects of process parameters, i.e., pH, collector concentration and superficial gas velocity, on the flotation efficiency and kinetics were evaluated. The results indicated that the performance of precipitate flotation prevails over ion flotation for the removal of metal ions from diluted wastewater. Zhang et al. [5] studied the utilization of selected metal ions for enhancing the demulsification of spent metalworking fluids with oily characteristics. It is concluded that the bi-metal ion combination demulsification treatment was efficient and much more economical than demulsification using membrane or thermal methods.

The treatment of oily wastewater was also studied by Bacha et al. [6]. The Authors tested the CaCO3-immobilized alkaline lipase from B. stearothermophilus for its suitability and efficiency in industrial applications. Conditions of alkaline pH and temperature stability, high catalytic effectiveness and tolerance for metal ions were confirmed for this biochemical method of oily wastewater purification.

Tseng and co-workers [7] investigated the application of a high-gradient magnetic separation for the recycling and reuse of super-paramagnetic adsorbent in wastewater

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treatment applications. A kinetic model was applied to describe the breakthrough behaviors of the effluent of a high-gradient magnetic separation and compared with the experimental results. It has been noticed that due to the low running cost and small space requirements of the new magnetic separation system, the broad applications involving the tested solution will attract more attention in the future.

Kogut and co-workers [8] investigated selected adsorption properties of graphene-modified nonwoven materials for wastewater treatment. It was found that Henry and Redlich–Petersen isotherms describe the tetracycline adsorption process by graphene-modified nonwovens in a suitable way, and the results may be of significant practical importance for wastewater treatment engineering combined with the adsorption process.

Rahimi and Eicker [9] published a paper on the mathematical modeling of microbial electrolysis cells for simultaneous wastewater treatment and hydrogen generation. Such an approach aims at enhancing wastewater treatment efficiency and fulfills the requirements of a circular economy approach. The study revealed that using a dual-chamber microbial electrolysis cell can decrease the power consumption of wastewater treatment plants by about two times compared to the traditional system. Such a solution can be considered as a decentralized treatment method in urban areas with simultaneous energy production based on renewable resources.

There are two papers published in the Special Issue that address the problems of exhaust gas emissions from engines. In one of the papers, Guo and co-workers [10] investigated the problem of uneven flow of sprays in the gas desulfurization system in marine applications. The results indicated that the flue gas was easily concentrated in the left side area of the scrubber, and this part of the hot gas could escape from the scrubber. By controlling the nozzles distribution and the nozzles angle, it was possible to reduce the droplets hitting the wall and improve the utilization rate of the washing liquid. The new arrangement of nozzles made the flow field distribution inside the scrubber more uniform and increased the gas–liquid reaction time. The other paper by Göbel et al. [11] focuses on the long-term behavior of fuel retaining systems for gasoline engines running on pure and bio-blended fuels. The papers report the results of measurements of the regeneration processes of the activated carbon by flushing it with humid nitrogen gas of 70% relative humidity. This research is of importance due to establishing a new quality criterion for the fuel vapor retaining systems.

The other two articles published in the Special Issue deal with the problem of aerosol occurrence in the air. Makowski and co-workers [12] studied droplet separation using wave-plate mist separators, conducting the calculation with the aid of computational fluid dynamics. Based on the results obtained, a new shape of drainage channels was proposed, which is characterized by high droplet removal efficiency with relatively low-pressure drop. Jackiewicz-Zagórska et al. [13] studied aerosol nanoparticle filtration using non-woven filters made of polylactic acid. This work proposes favorable process conditions necessary for obtaining good-quality filters. The obtained results are optimistic and are a step in producing efficient, biodegradable filters to remove nanoparticles from the air.

One review paper published in the Special Issue covers the topic of waste air biofiltration with a focus on process modeling [14]. This review presents the recent research results on biotrickling filtration of air polluted with single and multiple VOCs. An overview of the models describing biotrickling filtration and conventional biofiltration is presented in the paper, concerning the recent developments in biofiltration technology and showing the future research needs in this field.

Professionals and researchers in the fields of environmental protection, as well as chemical engineers and technologists of the air and water treatment methods, are warmly welcome to read the papers published in the Special Issue on Advanced Liquid Waste and Gas Waste Treatment Processes.

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