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Editorial

Wastewater Treatment Processes: Part I

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Cheap and plentiful, water was for centuries a manufacturing tool that industry took for granted. However, population growth, globalization, and climate change are shepherding in a new water-constrained era. The food-chain pyramid may receive contaminants of either surface water or ground water around industrial and residential communities (e.g., metals, pesticides, pharmaceuticals, etc.) through man's activities and on top of the pyramid, man (perhaps) receives pre-concentrated toxicity. A common given example constitutes areas such as Bangladesh, where many people consumed drinking water with arsenic concentrations—exceeding the guideline values of the World Health Organization (WHO).

A class of pollutants, in particular, that can cause carcinogenetic problems is dyes. Recently, adsorption has been widely applied on wastewater decontamination, because of its removal efficiency from dilute solutions; cellulose has been utilized as an adsorbent component due to its unique properties. Moreover, activated carbons have been among the effective adsorbents because of their excellent sorption capacity; their use has been often prohibited mainly due to their relatively high cost, low selectivity and regeneration problems. In recent years, the trend of researchers has been also to use some low-cost materials as adsorbent materials. For example, the idea was applied to leachate, a complex liquid that is often produced from landfills and it contains hazardous substances that may endanger the surrounding environment, if ineffectively treated. Among the other adsorbents, metal organic frameworks have been also developed due to their larger porosity and larger specific surface area.

Wastewater treatment plants focus, among others, on sustainability issues through the recovery of energy and nutrients from wastewater. Aeration is one of the most energy-consuming processes in the conventional activated sludge systems of wastewater treatment technology. Exploration and production of oil and gas generates considerable high-salinity wastewater discharged from offshore oil rigs; as a first step, physical treatment methods and electrolysis were applied. The application of membranes downstream is of interest, including to hospital wastewaters. The membrane bioreactor is a technology that has recently been applied to wastewater treatment for the purpose of reusing treated water and improving the sustainability of the water environment. Saline water treatment (i.e., in the Mediterranean area small islands) has become increasingly important for drinking water supplies.

The knowledge of chemistry can help in different separation processes, as evidenced by various examples; a wide variety of heavy metal bearing waste streams require treatment, so due to their solubilities and mobilities, toxic metals could cause significant damage to the environment. The effect of hydrophobic/hydrophilic organic ligands on sorption and sedimentation of—for instance—zinc oxide nanoparticles has been investigated. Basic chemistry has been (and can be) used to explore well flotation—the possibility if it works in a given system, expectation of the result/recovery, mechanism of this separation process itself including relative explanations; noting, of course, that without flotation, many common metals and inorganic raw materials would be exceedingly scarce and costly—because the high-grade ores that could be processed by simple physical and mechanical methods have long since been used up. Concluding, good, clean water just cannot be replaced—and it is becoming harder to come by. Typical processes that are investigated and applied to wastewater treatment include thes following: Biological, adsorption, flocculation, oxidation, membranes, filtration, and so on, including the nanotechnological.

This Special Issue on "Wastewater Treatment Processes" sought (and finally we believe succeeded) to present hereby high-quality works and topics (not only those) focusing on the latest novel wastewater processes. The first part of this Special Issue consists of 46 works (41 research articles; 3 review papers, 1 teaching note; 1 project report) from distinguished authors worldwide [1–46]. Among them, there are several processes of wastewater treatment including major techniques as adsorption [2,3,6,7,14,15,20, 25,31,36,38,40,45], membranes/filtration [8,35,37,43,44], floation/flocculation/coagulation [11,18,26,46], ultrasonication/ozonation/aeriation [13,23], electroprocesses [1,22,33], photocatalysis [34], etc. Many authors, whom we—as editors—thank very much, from various countries, contributed marvellously to this first part of the present Special Issue. All the aforementioned topics and much more were explored in detail. Certainly, the field of wastewater treatment and its processes is vast; the present hopefully adds one more, useful contribution.

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