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Editorial

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Environmental problems associated with water pollution have persistently been an important issue over decades, correlated negatively with the health and ecosystem. Hazardous chemicals find their way into waters from a variety of point or diffuse sources, including industrial plants, farmland, and landfill sites. With regard to water pollution prevention and control, a combined approach using control of pollution at source through the setting of emission limit values and of environmental quality standard should be applied. Hence, the application of appropriate water treatment technologies will remain essential.

The wastewater treatment (WWT) techniques frequently used to reduce harmful substances within can be divided into physical, biological and chemical. Urban wastewaters may also contain harmful, recalcitrant and persistent substances, particularly contaminants of emerging concern (CECs) that are present mainly due to uncontrolled discharge from above-mentioned sources. They are usually treated with only physical and biological techniques, gathered within primary and secondary treatment unit operations. Although such treatment is capable to greatly reduce the pollution, water often does not comply with current standards, which are becoming stricter. Numerous studies reported CECs presence upon primary and secondary treatment, leading to the conclusion that common WWT plants are limited regarding CECs removal and suggesting that their upgrade and implementation of advanced treatment technologies as tertiary treatment are required to achieve high-quality treated effluents. Moreover, wastewater containing some of CECs (e.g. pesticides and pharmaceuticals) very often cannot be treated by biological techniques, since they are either toxic for the microorganisms or designed to be biologically active and therefore their biodegradation is impossible. Accordingly, the tendency is toward greater use of chemical treatment, both to comply with standards and to recycle the used water more, which is the great goal for the future.There are varieties of (waste)water chemical treatment methods based on the application of strong oxidants or in-situ generation of oxidizing species. However, their constrains related to their chemistry, which may lead to the production of harmful by-products, as well as the reactivity and selectivity toward targeted pollutants, may provide significant implications at larger scale and should be taken into account when considering appropriate treatment method for the removal of organic, particularly recalcitrant, pollutants. Accordingly, in last several decades, advances in chemical treatment of water and wastewater resulted with the development of a numerous alternative chemical technologies; so-called advanced oxidation processes (AOPs).

The technologies based on AOPs offer viable solution for the treatment of (waste)waters of different origin, they are capable to degrade wide range of organics into the less harmful or biodegradable by-products, and eventually mineralize them. AOPs are considered as low- or even none-waste generation technologies, thus secondary treatment is avoided. Although the total mineralization of organic structures might be achieved by AOPs, such task could be sometimes rather costly. Hence, AOPs may serve as an effective tool for converting non- or low-biodegradable organics to more readily biodegradable intermediates. Accordingly, AOPs might precede secondary (biological) treatment to increase biodegradability and lower toxicity, i.e. to destruct recalcitrant chemical structures, or can be used as tertiary treatment in order to remove remained organics upon secondary. Generally, hydroxyl radicals (HO•) and its reactive analogues can be generated by chemical, electrical, mechanical or radiation energy. Thus, AOPs can be classified into chemical, electrical, mechanical and photo-assisted processes. *Chemical AOPs* include Fenton-based pro-

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cesses, involving the application of transitions ions (mostly iron) combined with strong oxidants (hydrogen peroxide or persulfate salts), as well as ozone-based processes, involving various combinations of catalytic ozonations and peroxone processes combining two or more oxidants. *Photo-assisted AOPs* include various photochemical processes, involving the application of UV irradiation sources with powerful oxidant (ozone, hydrogen peroxide and/or persulfate salts), and photocatalytic processes, involving the application of UV or solar energy and various semiconducting materials as photocatalyst. *Electrical AOPs* include processes capable of *in-situ* HO• generation by applying various types of electrical discharges (e.g. corona, glow, hydraulic), while ultrasound, also capable of splitting H_2O into radical species, is the main representative of *mechanical AOPs*.

This issue of *Journal of Advanced Oxidation Technologies* (JAOTs) brings 17 research articles, mainly focused on the latest achievements in AOPs application and development of new related materials, but also an upgrade toward new bioremediation processes. Although Fenton process is the oldest AOP, it is still attractive due to its simplicity and effectiveness. Hence, it's application in degradation of commercial insecticide imidacloprid was investigated, taking into account the role of common excipients such as propylene glycol, bringing the practical meaning to the performed research. There are several papers dealing with photocatalytic processes, but covering the subject of interest from different aspects. Hence, titania nanotubes, developed by hydrothermal method and characterized for morphology, structure and crystallinity, were applied for the degradation of herbicide paraquat. The development of another photocatalyst, $La_2Ti_2O_7$, was also investigated, while its application in photocatalytic degradation of Reactive Brilliant Red X3B dye was observed through the prism of applied calcination at different temperatures. Furthermore, photocatalytic degradation of insecticide diazinon by Fe_3O_4-WO_3 nanoparticles under UV irradiation was investigated, taking into account the influence of various process and water matrix parameters. Visible light-active photocatalyst BiOBr, synthesized with Gemini surfactant and consequently characterized for morphology, structure and optical absorption properties, was shown to be rather effective in removal of rhodamine B (RhB) dye. The photoelectrocatalytic process using W/WO_3photoanode was successfully applied for degradation of two hair dyes, Basic Brown 16 and Basic Blue 99, with potential toxicological and mutagenic effects. The effectiveness in electrochemical generation of hydrogen peroxide with boron doped diamond electrodes was investigated taking into account the influence of operating parameters employing experimental and theoretical approaches. The development and application of electrochemical AOPs for the degradation of poly- and perfluoroalkyl substances, recently listed as CECs, was critically reviewed. Another review focused on the application of the variety of AOPs for polyvinyl alcohol, a recalcitrant pollutant, was presented. There are also several studies focused on electrical and mechanical AOPs presenting; (i) numerical model for excitation kinetics of O(1D) in low-pressure discharge plasma, (ii) experimental study on the influence of operating parameters of dielectric barrier discharge for methyl orange degradation, and (iii) mechanistic insights on the cativation and degradation of phenol at interface and bulk using different additives. The wet peroxide oxidation, a non-ambient AOP, was applied for the treatment of wastewater from epoxy resin with a high salinity. Although AOPs are in the main focus of the JAOTs, journal is not strictly directed to them and this issue contains several papers that are not directly related to AOPs, but are in line with the principles of green chemistry and environmental pollution prevention. (i) Two are focused on biotreatment, either of CECs or using new bacterial culture, (ii) one paper deals with ethane degradation using new co-catalyst; V-Mo-Nb-Te-Ox, while (iii) another paper is focused oil-water separation using a novel ClO_2-oxidation-based demulsification method.

I would like to expresses my deep gratitude to the contributing authors for their outstanding works, as well as all reviewers for their valuable comments and time during peer-reviewed process. Finally, I hope so that the readers will find this issue of JAOTs interesting, informative and valuable for their future research and ideas.