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Editorial: Advanced physico-chemical technologies for water detoxification and disinfection

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Editorial on the Research Topic
Advanced physico-chemical technologies for water detoxification and disinfection

One of the most critical challenges we face today is access to clean water. Climate change, industrialization, high rates of urbanization, and population growth have resulted in many countries suffering from water crises, especially in the arid and semi-arid areas. Countries in different regions of the world have also been struggling over regional water availability and it is anticipated that these struggles may result in conflicts over shared water resources in these regions. Considering the adverse consequences of the water crisis, countries have been trying to increasingly cope with this problem of water availability by implementing sustainable water management plans and looking for alternative water supply sources.

Water conservation, water reuse, and desalination of seawater and brackish groundwater are among those strategies that have been implemented to address the water crises. In recent years, more and more countries are considering water reuse as an alternative water supply to supplement freshwater sources. Water reuse decreases the pressure on freshwater resources, reduces the pollution that is being discharged to water bodies, and can be a reliable source compared to other water resources that are directly dependent on rainfall. One of the barriers to water reuse is concern over its potential negative impact on human and environmental health. Even today, treated and untreated wastewater reuse is sometimes poorly controlled. A large portion (estimated at over 80% globally, and over 95% in some developing countries) of the world's wastewater is still released to the environment without treatment. The current challenge is to make reuse circuits shorter, safer, and economically sustainable.

Access to safe drinking water, sanitation, and hygiene is a basic human need for sustainable health and wellbeing. Nevertheless, billions will lack access to these basic services in 2030 unless progress to accomplishing the Sustainable Development Goals (SDGs) increases in the following 8 years (Padhye et al., 2022). According to the United

Nations (UN), in 2030, 1.6 billion people will lack safe drinking water, while 2.8 billion will lack access to sanitation, and 1.9 billion will lack hand hygiene facilities (United Nations, 2022). Very little progress has been reported with various targets remaining unchanged (Roy et al., 2022). For example, only 1% increase in safely managed drinking water services (target 6.1.1) and safely managed sanitation services (target 6.2.1a) have been accomplished while population with a handwashing facility with soap and water available at home (target 6.2.1b) and transboundary basin areas with operational arrangement for water cooperation (6.5.2) remain almost unchanged since 2015 (Aly et al., 2022). Based on the current advances, it has been estimated that, to achieving the different SDG six targets by 2030, the pace of implementing basic drinking water need to be increased twice, while safely managed drinking water and basic sanitation need to increase four times (Padhye et al., 2022). To support the successful achievement of these targets, there is a significant variety of innovative processes that can be applied to improve water quality (Villasenor-Basulto et al., 2022). These processes, however, can be both extremely costly and require a long treatment time (Ortiz-Marin et al., 2022). Therefore, identifying and examining cost-effective technologies capable of purifying potable water and removing persistent pollutants in complex water effluents are needed (Bustos-Terrones et al., 2022).

This Research Topic, titled "*Advanced physico-chemical technologies for water detoxification and disinfection*," is centered on innovative water treatment technologies, and included research related with the treatment of emerging pollutants in water, water quality, water disinfection and pollutant oxidation, water resources management and climate change. The overarching goal of was to collect information worldwide about different physico-chemical technologies developed for water detoxification and disinfection, their kinetics, fundamentals, mechanisms, scaling-up, and real-scale applications to address the problem posed by the lack of access to safe water supply sources and/or alleviate the risks involved in wastewater reuse. Being this research significant for taking care of peoples' health and ecosystems, the Research Topic was presented so the scientific community can share novel water treatment technologies and contribute to enhancing SDG six accomplishment by securing water safety, water management, and leading towards hygienic practices, particularly in developing countries and/or underserved communities in developed countries.

The published papers are expected will help to advance in the development of emerging technologies which will bring a new perspective to the global environmental challenges described earlier and help to provide guidelines on innovative ways to enhance the pace for SDG six achievements related to safe drinking water and sanitation. The scope of our vision included, but was not limited by, novel scientific research and review papers on the following themes: (i) phase change advanced water detox and disinfection (e.g., adsorption, membrane technologies, phase separation technologies); (ii.) advanced oxidation processes (e.g. photocatalysis, Fenton and Fenton-like processes, wet oxidation); (iii) materials for water detoxification and disinfection (e.g. advanced materials, nanomaterials, polymeric, and natural); (iv) ultrafiltration for water purification; (v) pilot treatment and upscaling studies; (vi) toxicity assessment of the treated effluents; and (vi) environmental impacts of the treated effluents.

The Research Topic included in this special issue discuss the treatment of persistent pollutants such as herbicides (Bayona et al.), pharmaceuticals (Hamed et al.), and dyes (Orozco et al.) using different processes including photocatalysis, oxidation using immobilized microorganisms (Hernandez-Romero et al.), zero-iron nanoparticles (Liang et al.), and phytoremediation (Szymanska-Pulikowska and Wdowczyk). We acknowledge there is still a lot of room for research contributions to satisfy these genres, but submit the research and papers associated as a first step to open this Research Topic for discussion in the future.

Author contributions

Authors worked as a team to create the content of this manuscript. Draft version was generated by YB-T and EB. LP-E, LN, and AE Nemr reviewed and edited the draft. EB created the revised final version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

References

Aly, M. M., Refay, N. H., Elattar, H., Morsy, K. M., Bandala, E. R., Zein, S. A., et al. (2022). Ecohydrology and flood risk management under climate vulnerability in relation to the sustainable development goals (SDGs): A case study in nagaa mobarak village, Egypt. *Nat. Hazards* 112, 1107–1135. doi:10.1007/s11069-022-05220-2

Bustos-Terrones, Y. A., Bandala, E. R., Moeller-Chavez, G. E., and Bustos-Terrones, V. (2022). Enhanced biological wastewater treatment using sodium alginate-immobilized microorganisms in a fluidized bed reactor. *Water Sci. Eng.* 15, 125–133. doi:10.1016/j.wse.2022.02.002

Ortiz-Marin, A. D., Bandala, E. R., Ramirez, K., Moeller-Chavez, G., Perez-Estrada, L., Ramirez-Pereda, B., et al. (2022). Kinetic modeling of UV/H2O2, UV/sodium percarbonate, and UV/potassium peroxymonosulfate processes for albendazole degradation. *React. Kinet. Mech. Catal.* 135, 639–654. doi:10.1007/s11144-021-02152-z

Padhye, L. P., Bandala, E. R., Wijesiri, B., Goonetilleke, A., and Bolan, N. (2022). Hydrochar: A promising step towards achieving a circular economy and sustainable development goals. *Front. Chem. Eng.* 4, 867228. doi:10.3389/fceng.2022.867228

Roy, A., Basu, A., Su, Y., Li, Y., and Dong, X. (2022). Understanding recent trends in global sustainable development goal 6 research: Scientometric, text mining and an improved framework for future research. *Sustainability* 14, 2208. doi:10.3390/su14042208

United Nations (2022). The sustainable development goals report 2022. *Web page*, N/A. Available at: https://sdgs.un.org/goals/goal6.

Villasenor-Basulto, D., Kadier, A., Singh, R., Navarro-Mendoza, R., Bandala, E. R., and Peralta-Hernandez, J. M. (2022). Post-tanning wastewater treatment using electrocoagulation: Optimization, kinetics, and settlement analysis. *Process Saf. Environ. Prot.* 165, 872–886. doi:10.1016/j.psep.2022.08.008