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Greening the 21st century environmental engineering – A robust platform to mitigate contaminants of emerging concern

1. Introduction

This special issue of Case Studies in Chemical and Environmental Engineering deals with the 21st century environmental engineering perspective to mitigate contaminants of emerging concern. Over the recent decades, a rampant industrial boom, urbanization, and an exponential increase in population growth resulted in numerous environmental impacts with water being one among the leading affected resources. All different kinds of pollutants, for example, organic compounds, heavy metals, dyes, pharmaceuticals and personal care products, pesticides, persistent/volatile organic compounds, petroleum hydrocarbons and toxic gases, have a paramount effect, either directly or indirectly, on human health and aquatic entities [1]. Human-made, agricultural, and industrial disposals play a substantial contribution in triggering wastewater pollution. Strategies for their affordable and efficient decontamination of these emerging pollutants have become the prime focus of academic researchers, industry, and government to constitute a sustainable human society. Classical techniques for determining and treatment of environmental contaminants are associated with several limitations, such as inefficiency, complex pretreatments, overall high process cost, generation of high sludge, and formation of highly toxic side-products [2]. Therefore, new, and state-of-the-art technologies possessing the advantages of detection, ease of use, and continuous degradation of environmental pollutants, are highly desirable.

Nano-catalysis and nano-adsorption have recently gained increasing attention in environmental applications [3,4]. Catalysts for environmental mitigation are generally based on less expensive materials, which are unlikely to cause secondary pollution. In addition, the chemical conversion of hazardous pollutants into non-hazardous and less toxic products is the major advantage of environmental catalysis [5]. The pollutants can be eliminated and transformed efficiently via heterogeneous or homogenous oxidation and reduction processes under ambient conditions or the conditions light as the external energy source. There is a rising trend in applying processes based on new or innovative materials, a large variety of nano-constructs with catalytic or adsorption properties, to catalyze the removal of detrimental xenobiotics either by adsorption or disintegrating into biologically inactive products [5].

Catalysis using nanoscale materials can meaningfully promote advanced oxidation processes for degradation of organic pollutants. Furthermore, catalytic ozonation, photocatalysis, selective catalytic reduction, volatile organic compounds, and persistent organic compounds elimination are also imperative areas that can be benefitted by utilizing nano-catalysis. Notwithstanding exceptional environmental promise, nano-based emerging technologies necessitate immediate research attention regarding their potential environmental risks. To date, neither nanotechnologies nor the engineered nanomaterials to recuperate polluted sites are subjected to any environmental regulations. Moreover, the nano-remediation effects on targeted systems, and its adverse consequences remain to be fully elucidated [6,7].

This special issue was an effort to glance at state-of-the-art recent trends and advances that aim to green the 21st-century environmental sciences to tackle ECs of high concern. In total, 12 articles were published in this VSI: Environmental engineering and their authors are from all over the world. We take the opportunity to thank the authors for their high-level contributions as per the set VSI theme. Moreover, the referees' supportive efforts and hard work are gratefully acknowledged. Finally, we, the guest editors' team, highly appreciate the help of Editor-in-Chief - Prof. Dr. Damià Barceló and the Journal Manager for encouraging and facilitating the VSI: Environmental engineering and their assistance in the smooth editorial process.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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