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Editorial

Special Issue on "Advanced Catalytic Material for Water Treatment"

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Water is the source of life on Earth. Sustainable society development heavily relies on a healthy water ecosystem. However, fast urbanization, industrialization and the extensive use of chemical fertilizers, pesticides and other synthetic chemicals have posed great threats to clean water systems by discharging large amounts of non-biodegradable wastewater. Increasing public attention to water crises and the emission of pollutants has driven a huge motivation to develop advanced catalytic technologies in recent decades. Among various water technologies, catalytic transformation with novel materials offers the opportunity to efficiently detoxify and remove pollutants for deep water purification. In this account, we organized this Special Issue with the aim of providing new findings in areas of designing novel advanced catalysts, developing new catalytic processes, recycling raw materials, etc., for water and wastewater treatment.

In total, there are 22 articles published in this Special Issue, including 20 experimental research articles and 2 review articles. Six of them focus on photocatalytic materials and processes. Xu et al. studied the photocatalytic degradation of tetracycline under visible light irradiation with dual Z-scheme $CuBi_2O_4/Bi_2Sn_2O_7/Sn_3O_4$ photocatalysts, and found that the construction of the Z-scheme heterojunction could effectively promote the separation and migration of photogenerated carriers [1]. Peng et al. prepared a Mn-Co-MCM-41 molecular sieve using a thermo-sensitive template, and showed good catalytic performance on the degradation of RhB [2]. Hou et al. reported the Fenton-like degradation of tetracycline with a Co-CNK-OH photocatalyst, and revealed that Co(III)/Co(II) redox was able to accelerate the generation of $^1O_2$, $\cdot O_2^-$ and h^+ in the reaction system [3]. Qiu et al. found that carbon quantum dot modification could enhance the photocatalytic activity of $ZnIn_2S_4$ nanoflowers for chlorophenol degradation [4]. Du et al. made a high-energy TiO_2 nano photocatalyst with co-exposed {001} and {120} facets, and verified that the anatase structure, particle size and surface area and exposed facets of the nanocrystal all contributed to its photocatalytic performance [5]. Zhao et al. fabricated a core–shell $ZnO\text{-}C/MnO_2$ material with an all-solid state Z-scheme heterojunction structure and a high photocatalytic reactivity [6].

Moreover, eleven papers seek to provide more insightful results in the field of Fenton-like advanced oxidation. Yang et al. discovered that reducing sulfur species including SO_3^{2-}, HSO_3^-, S^{2-} and HS^- could significantly accelerate the Fe(III)/Fe(II) cycle in Fe(III)/PS systems even at a low concentration [7]. Wang et al. investigated the treatment of coking wastewater via the α-MnO_2/PMS process, and found that this catalytic treatment can significantly improve the biodegradability of wastewater [8]. Tian et al. reported large-scale synthesis of iron ore and biomass-derived biochar to activate the persulfate oxidation of tetracycline hydrochloride [9]. Additionally, Qi et al. constructed a Bi_2WO_6/PMS system where carbamazepine could be efficiently degraded with the assistance of visible light irradiation [10]. Li et al. proved a synergistic effect between nickel ferrite and microwaves in activating persulfate for organic pollutants' degradation [11]. Also, the influence of some

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ionic components on the performance of Fenton-like processes was studied. Tang et al. demonstrated the adverse effects of sulfate on brilliant red oxidation by Fe^{2+}-activated persulfate, and indicated that this negative influence could be counteracted either via batch addition of ferrous or by adding Ba^{2+} to remove $SO_4{}^{2-}$ in the system [12]. On the contrary, Feng and Li discovered that chloride could enhance the removal of ammonia nitrogen and organic matter from landfill leachate in a microwave/peroxymonosulfate system [13]. In addition to persulfate or peroxymonosulfate, He et al. found that sludge biochar obtained at an increased pyrolysis temperature was able to activate periodate and degrade sulfamethoxazole through an electron-mediated transfer mechanism [14]. Ling et al. validated the effectiveness of S-nZVI/H_2O_2 Fenton-like systems toward the synchronous removal of Cr(VI) and bisphenol A [15]. Furthermore, Sun et al. [16] and Li et al. [17] summarized the recent research progress in a persulfate-based advanced oxidation system. The authors included discussions regarding the electrochemical-assisted and metal catalytic activation of persulfate, mechanisms, types of catalysis reactions, as well as future directions.

Additionally, some interesting results in the area of catalytic reduction and adsorption were also achieved. Anum et al. synthesized bimetallic sulfides/MOF-5@graphene oxides, which can quickly eliminate hazardous moxifloxacin [18]. Liao et al. found that FeMgAl/MoS_4 LDH could remove Se(IV) and Se(VI) in high capacities of 483.9 mg/g and 167.2 mg/g, respectively, and the existence of Fe in LDH layers obviously enhances the removal process [19]. Elmansouri et al. developed an almond shell material which can economically and effectively remove urban wastewater pollutants [20]. Huang et al. modified SBA-15 with dithiocarbamate chitosan and achieved a significant improvement in the catalytic removal of vanadium [21]. Demirci et al. functionalized magnetic γ-Fe_2O_3 with leucyl-glycine and then coated it with polydioxanone to form novel γ-Fe_2O_3-CA-Leu-Gly-PDX nanoparticles, which showed excellent antifouling properties when being used to modify a polyethersulphone membrane [22].

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