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Editorial

Sustainable Processes for the Removal of Heavy Metals from Aquatic Systems

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Water pollution is a global problem threatening the entire biosphere and affecting the life of many millions of people. It is not only one of the foremost global risk factors for illness, diseases and death, but also contributes to the continuous reduction of the available drinkable water sources worldwide. Delivering valuable solutions, which are easy to implement and affordable, often remains a challenge.

Heavy metal ions are some of the most harmful and widespread contaminants, with adverse effects to the environment. These ionic species, mainly cations, are one of many deadly contaminants in ground water across the globe. The physical-chemical properties and composition of the affected waters and sediments present strong spatial variations depending, mainly, on the proximity to the discharge point, and strong seasonal variations are detected depending on the rainfall and temperature regime.

Therefore, the use of environmentally friendly technologies and the reuse or revalorization of all waste generated is a strategy that must be widely assumed. For example, biosorption of heavy metals by metabolically inactive non-living biomass of microbial or plant origin is an innovative and alternative technology for the removal of these pollutants from aquatic systems.

This Special Issue compiled 13 different research works [1–13], including 1 review paper [13]. This publication collection covers a wide range of topics related to the enhanced removal of heavy metals during primary treatments in wastewater management including speciation [13], sorption technologies [1–7,9,11], complexation [8] and coagulation [12]. The main heavy metals addressed are: Cr(VI) [3,5,12], Cr(III) [2,6,9], Co(II) [11], iron [8], Cu(II) [2,4,7], Ni(II) [1,3], Cd(II) [1,2,6], Pb(II) [2,6] and Zn(II) [1], among others, such as alkaline earth elements [8].

Different materials such as Ni-Al alloy [12], inorganic adsorbents such as silica SBA-15 and titanosilicate ETS-10 [4], biomass [1–3,5,11], membranes (i.e., chitosan) [9], nanocellulose [8], ZnO nanoparticles [7], biosynthesized adsorbents (from oyster shells) such as hydroxyapatite [6] and nano modified coffee husk and coffee lignin [2] are presented in this volume. The strategy for their removal varies between direct (bio)adsorption, optimizing parameters such as pH, contact time, adsorption temperature and surface charge density [10]. In two cases, a complementary antibacterial effect is included during the separation process [2,6], which is related to corresponding biomass development. In one case, a strategic safe disposal of the spent adsorbents is presented [1], which is an interesting and novel approach for the sustainability of adsorption processes.

Finally, thanks to all the contributions, this Special Issue demonstrates the feasibility of sustainable materials and processes mainly for heavy metal removal from aqueous wastes.

Institutional Review Board Statement: Not applicable.

Citation: Bastos-Arrieta, J.; Palet, C. Sustainable Processes for the Removal of Heavy Metals from Aquatic Systems. *Water* **2023**, *15*, 761. https://doi.org/10.3390/w15040761

Received: 29 January 2023
Revised: 2 February 2023
Accepted: 7 February 2023
Published: 15 February 2023

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: Authors declare no conflict of interest.

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