






Cite this: *Chem. Soc. Rev.*, 2019,
48, 463

Sustainable technologies for water purification from heavy metals: review and analysis

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Water pollution is a global problem threatening the entire biosphere and affecting the life of many millions of people around the world. Not only is water pollution one of the foremost global risk factors for illness, diseases and death, but it also contributes to the continuous reduction of the available drinkable water worldwide. Delivering valuable solutions, which are easy to implement and affordable, often remains a challenge. Here we review the current state-of-the-art of available technologies for water purification and discuss their field of application for heavy metal ion removal, as heavy metal ions are the most harmful and widespread contaminants. We consider each technology in the context of sustainability, a largely neglected key factor, which may actually play a pivotal role in the implementation of each technology in real applications, and we introduce a compact index, the Ranking Efficiency Product (REP), to evaluate the efficiency and ease of implementation of the various technologies in this broader perspective. Emerging technologies, for which a detailed quantitative analysis and assessment is not yet possible according to this methodology, either due to scarcity or inhomogeneity of data, are discussed in the final part of the manuscript.

Received 23rd August 2018

DOI: 10.1039/c8cs00493e

rsc.li/chem-soc-rev