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Editorial: Biogeochemistry of metals in contaminated environments

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Editorial on the Research Topic

Biogeochemistry of metals in contaminated environments

With the development of industrialization and urbanization, the demand of metal mining increases rapidly, resulting in groundwater, soil and air pollution (Ghani et al.; Lv et al.; Tian et al., 2022). Prolonged exposure to high concentrations of metals (such as lead, zinc, cadmium, arsenic, and antimony) seriously harms human health, ecological environment, and biodiversity (Qi et al.; Zhang and Zhang). Hence, it is important and urgent to understand the impact of metals on the environment. Furthermore, the hazards and biogeochemical transformation of metals are different due to various environmental factors (Ding et al.; Ghani et al.). In the past 20 years, there were 1,406 publications on biogeochemical transformation of metals in contaminated environment, from 27 in 2003 to 144 in 2022. The major researches contain metal biogeochemical transformation under biological or non-biological factors.

This Research Topic in the Frontiers in Environmental Science is a compilation of reviews and research papers with the theme of biogeochemical transformation and environmental effect of metals. Latest research covering the multidisciplinary of environmental science, hydrogeochemistry, and biogeochemistry is major to display the latest advancements in transformation characteristic and environmental effect of metals. In this issue of the Frontiers in Environmental Science includes one focused review and seven research articles, with a spotlight on metal in the fields of (a) ecological risks, (b) the influence of biological activity, (c) the speciation and migration in different environmental media, and (d) hydrogeochemical characterization. The above eight papers describe the direction and objectives of further research, to provide a comprehensive understanding of metals migration characteristics and environment impact.

In the field of ecological risks (two papers), Qi et al. thoroughly assessed the contamination condition and ecological risk of heavy metals in soils around three typical antimony mining areas in China. Lv et al. demonstrated wind, distance, and vegetation coverage all have an impact on the spatial distribution of heavy metals and proved the importance of ecological risk assessment for the remediation of heavy metal pollution. There are three articles in the field of impact on biological activity, referring to plants and animals. Zhang and Zhang studied metabolites of purple Perilla under shaded and Cd conditions. It indicated that pyruvate and histamine played an important role in the metabolism of purple Perilla. Liu et al. showed that the presence of nano-montmorillonite

reduced the uptake of cadmium by oilseed rape and increased the microbial diversity of soil. While, Saad et al. proved that the existence of alkaline rocks had a negative impact on Nile tilapia (*Oreochromis niloticus*). For different species, the toxicity of metals varies. Ding et al. described the speciation and migration of heavy metals in different environments, and confirmed the relationship between the toxicity of heavy metals and biological species. Baldasso et al. proved that there had a low mobility of heavy metals in municipal solid waste after anaerobic digestion along the soil plane. In the field of hydrogeochemical characterization, Ghani et al. investigated the geochemical behavior of groundwater arsenic pollution in two regions of Pakistan, indicating the importance of reducing arsenic pollution to reduce health risks.

To sum up, this Research Topic mainly focuses on metals in contaminated environments, which reflects the desire to comprehensively understand the migration characteristics and environmental impact of metals through interdisciplinary research. We hope that the contents of this Research Topic can encourage relevant workers to obtain more new breakthroughs in this field and promote interdisciplinary cooperation.

References

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Author contributions

WG: Writing the manuscript and Writing modifying. CW: Conceptualization, Writing—review and suggestion.

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.

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