



Short communication

Eco-friendly water treatment: The role of MIL metal–organic frameworks for the bisphenols adsorption from water

Afzan Mahmad ^{a b}, Teh Ubaidah Noh ^c  , Nurul Izzah Khalid ^d  [Show more](#)  Share  Cite<https://doi.org/10.1016/j.inoche.2023.110643> [Get rights and content](#) 

Highlights

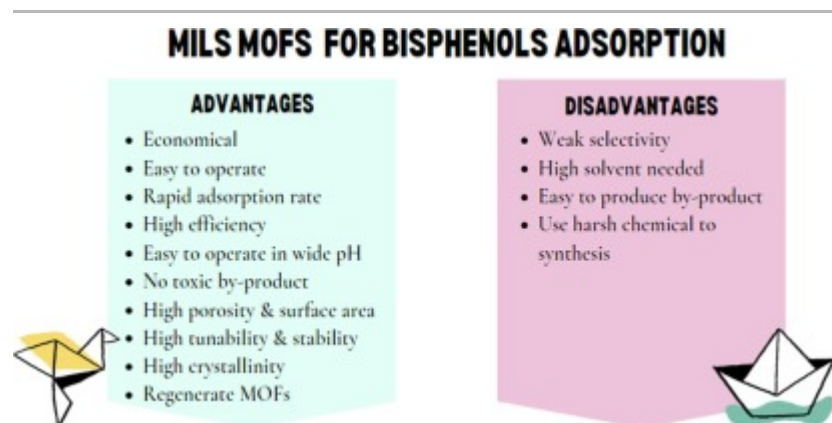
- A review of the use of MILs MOFs for the adsorption of bisphenols (BPA, BPF, BPAF, and BPS) was conducted.
- The review examined the adsorption capacity of various MILs MOFs (MIL-100, MIL-101, MIL-53, and MIL-88) for bisphenols removal.
- The review analyzed adsorption equilibrium, kinetic, and thermodynamic studies of bisphenols adsorption using MILs MOFs.
- The review evaluated the regeneration/reusability and feasibility of MIL MOFs for bisphenols adsorption studies.

Abstract

Achieving the Sustainable Development Goals (SDGs) 2023 required prioritizing the reduction of water pollution, including bisphenols pollution, in order to protect the environment and human health. Metal–organic frameworks (MOFs), specifically MILs (MIL=Material Institute of Lavoisier),

acquired recognition as promising materials for bisphenols adsorption because of their adaptability and unique properties. This review summarized the recent updates of knowledge on MILs, including an overview of bisphenols in wastewater environments and MILs MOFs, synthesis techniques, mechanisms, equilibrium, kinetic modelling and thermodynamic studies, the effect of pH and ionic strength, regeneration/reusability studies, the feasibility of MILs MOFs as well as challenges and prospects for bisphenols adsorption. However, further research was needed to understand the mechanisms and relationships underlying MILs and enable their practical, commercial-scale use in bisphenols remediation. This review highlighted the growing importance of MILs MOFs in environmental applications and the necessity in green technologies for substantial remediation.

Graphical abstract



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Introduction

Water pollution, including pollution caused by bisphenols, can have negative impacts on the environment and human health. Addressing this issue is a vital aspect of achieving the Sustainable Development Goals (SDGs) 2023, adopted by the United Nations General Assembly in 2015. Bisphenols are a class of chemical compounds applied to various industrial and consumer products[73]. They are characterized by two phenol groups: aromatic rings with attached hydroxyl ($-OH$) groups [58]. Some studies have suggested that exposure to certain bisphenols may harm human health[54], [53], [57]. This property has led to concerns that bisphenols may act as endocrine disruptors, which are chemicals that interfere with the functioning of the endocrine (hormonal) system[30]). Evidence from animal and human studies suggests exposure to bisphenols may have adverse health effects, including effects on the reproductive system, metabolism, and brain development[44], [30], [53].

The physiochemical treatment of wastewater pollution involves a series of physical and chemical processes to remove contaminants from the wastewater[54]. Adsorption is often used with other physiochemical treatment processes, such as sedimentation, flocculation, and filtration, to eliminate contaminants from wastewater[6]. Moreover, adsorption is a simple and effective way to