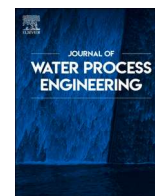




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## Journal of Water Process Engineering

journal homepage: [www.elsevier.com/locate/jwpe](http://www.elsevier.com/locate/jwpe)

## Applications of perovskite oxides for the cleanup and mechanism of action of emerging contaminants/steroid hormones in water

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## ARTICLE INFO

## Keywords:

Adsorption

Hormones

Perovskites

Photocatalysis

Water

## ABSTRACT

The contamination of water sources by emerging contaminants, specifically steroid hormones, is swiftly becoming a serious threat to both humans and the environment. However, a solution has emerged in the form of perovskite oxides, which show great potential in removing these contaminants from water sources. Perovskite oxides possess remarkable adsorption and catalytic properties, making them ideal for removing a wide range of emerging contaminants from water. Their unique crystal structure and surface features provide multiple active sites for adsorbing steroid hormones, utilizing surface interactions, ion exchange, and chemisorption to capture and retain these contaminants effectively. Furthermore, perovskite oxides can catalytically degrade steroid hormones through oxidation or reduction reactions, breaking down complex molecular structures and converting them into less harmful byproducts. They can also be engineered selectively for specific contaminants, allowing for a tailored approach to water treatment. Additionally, their regenerative capabilities make them sustainable, enabling multiple cycles of use while minimizing the environmental impact of water treatment processes. Overall, perovskite oxides offer a promising solution to cleaning up water contaminated with emerging contaminants, and their effectiveness in addressing the specific challenges posed by steroid hormones is particularly noteworthy.

### 1. Introduction

Endocrine disrupting chemicals (EDCs) including steroid hormones are micro-pollutants of emerging concern that have garnered the interest of researchers in recent centuries. They are exogenous chemicals that tamper with hormonal activities by meddling with the production, release, transportation, metabolism, receptor binding, or elimination of endogenous hormones, thereby disrupting the normal functionality of endocrine systems [1–10]. Notably, Steroid hormones (SHs) are among

the most popular EDCs that have been classified as group 1 carcinogenic compounds [11] and are commonly studied owing to their lethality and prevalent use as active ingredients in hormonal treatments, particularly in sexual differentiation, reproduction, growth, and development; use in birth control and contraceptives tablets, animal drugs and feeds, sexual enhancement drugs, illicit sports drugs, personal care products, and menopause-related drugs; management and treatment of menopausal syndrome, menstruation irregularities, and infertility/barrenness; and treatment of human diseases like asthma, chronic allergies, skin

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<https://doi.org/10.1016/j.jwpe.2023.104753>

Received 28 July 2023; Received in revised form 4 December 2023; Accepted 27 December 2023

Available online 3 January 2024

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