



Editor:
Wasu Pathom-aree,
Chiang Mai University, Thailand

Article history:
Received: July 27, 2020;
Revised: November 4, 2020;
Accepted: November 25, 2020;
Published online: March 5, 2021

Corresponding author:
Hamidi Abdul Aziz,
E-mail: cehamidi@usm.my

Reviewed article

Chlorine and Chlorinated Compounds Removal from Industrial Wastewater Discharges: A Review

Mohammad Al-Hwaiti¹, Hamidi Abdul Aziz^{1, 2,*}, Mohd Azmier Ahmad^{2, 3}, and Reyad Al-Shawabkeh⁴

¹ School of Civil Engineering, Engineering Campus, Universiti Sains Malaysia, 14300 Nibong Tebal, Pulau Pinang, Malaysia

² Solid Waste Management Cluster, Science and Technology Research Centre, Engineering Campus, Universiti Sains Malaysia, 14300 Nibong Tebal, Pulau Pinang, Malaysia

³ School of Chemical Engineering, Universiti Sains Malaysia, Pulau Pinang, Malaysia

⁴ Faculty of Engineering, Chemical Engineering Department, University of Jordan, Amman, Jordan

Abstract Adsorption techniques for industrial wastewater treatment rich in heavy metals and aqueous solutions of water-soluble such as Cl^- , F^- , HCO_3^- , NO_3^- , SO_4^{2-} , and PO_4^{3-} , often include technologies for toxicity removals. The recent advancement and technical applicability in the treatment of chlorine and chlorinated compounds from industrial wastewater are reviewed in this article. Chlorine and chlorinated compounds are among the common discharged constituents from numerous industries. They can be carcinogenic or naturally toxic and can pose issues to aquatic ecosystems and human beings. Thus, elimination of chlorides and chlorinated compounds from water or wastewater is inevitable to get rid of the problem. Several techniques are being applied for the reduction of chlorine and chlorinated compounds in water. These include biodegradation, photochemical, adsorption, chemical, electrochemical, photo-electrochemical, membrane, supercritical extraction and catalytic method. Chlorine can react with various organic and inorganic micro-pollutants. However, the potential reactivity of chlorine for specific compounds is small, and only minor variations in the structure of the parent compound are anticipated in the water treatment process under typical conditions. This paper reviews different techniques and aspects related to chlorine removal, the types of chlorine species in solution and their catalyst, chlorine fate and transport into the environment, electrochemical techniques for de-chlorination of water, kinetics, mechanisms of reduction of chlorinated compounds, and kinetics of the electrochemical reaction of chlorine compounds.

Keywords: Industrial waste, Kinetics, Wastewater, Water purification

Citation: Al-Hwaiti, M., Aziz, H.A., Mohd Azmier Ahmad, M.A., and Al-Shawabkeh, R. 2021. Chlorine and chlorinated compounds removal from industrial wastewater discharges: A review. CMUJ. Nat. Sci. 20(3): e2021047.