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Degradation pathways of 1,4-dioxane in biological and advanced oxidation processes

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ABSTRACT

1,4-Dioxane is widely used in industry and seriously contaminates the ecosystem due to intentional discharge into water streams. Treatment of water/wastewater containing 1,4-dioxane is greatly growing since, it is listed as a priority pollutant and a hazardous compound for humans and environment. Degradation pathways of 1,4-dioxane in biological and advanced oxidation processes (AOPs) are extensively discussed in this review to identify potential bottlenecks which limit 1,4-dioxane removal processes and possibly allow the identification of the needed treatment approach. Furthermore, the efficiency of hybrid photocatalytic oxidation processes for treatment of wastewater rich 1,4-dioxane is comprehensively performed. During the degradation of 1,4-dioxane, several by-products/intermediates are produced as the consequence of the ring opening of 1,4-dioxane molecules, namely: ethylene glycol, glycolic acid, oxalate anion and formic acid. The efficiency of AOPs for oxidation of 1,4-dioxane is an excellent technology; however, the treatment cost is still quite high. Phytoremediation of water/wastewater containing 1,4-dioxane is a promising approach where conversion of 1,4-dioxane into biomass is performed avoiding severe pollution conditions.

Keywords: 1,4-Dioxane; Advanced oxidation processes; Hybrid photocatalysis; Biodegradation; Phytoremediation