#662 / Oral Communication
TOPIC : Waste and side streams valorization

Combined use of photocatalytic treatment and microalgal cultivation for glyphosate removal from contaminated waters

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PURPOSE OF THE ABSTRACT

Glyphosate (N-(phosphonomethyl) glycine) is one of the most widely used compounds in herbicide products. Introduced by the Monsanto Company (USA), it was initially utilized in fruit trees cultivations, public parks in urban areas, and then in crops and for the elimination of some aquatic plants in water bodies (Maqueda et al., 2017). Although its indiscriminate usage, the potential effects of glyphosate-based herbicides on non-target organisms are mostly unknown and it is classified as probably carcinogenic compound to humans. For this reason, there is an urgent need to eliminate these compounds from wastewaters during their treatment. Several techniques were proposed for the removal of glyphosate from wastewaters, such as adsorption, chemical degradation, and microbial degradation (Feng et al., 2020). Amongst them, photocatalytic degradation is one of the most interesting technologies as it is considered environmentally friendly and versatile. It is realised in the presence of heterogeneous catalyst such as titanium dioxide (TiO_2), which has demonstrated to be ideal for the photocatalytic degradation of many emerging pollutants and antibiotics, in the presence of an UV radiation ($\lambda \leq 380$ nm) (Li et al., 2022). The photocatalytic degradation of glyphosate leads to the production of small, atoxic, compounds such as formic acid, nitrate, ammonium and phosphate. Microalgae are a class of photosynthetic microorganisms which may be well applied to the wastewater treatment because of their efficiency in the removal of inorganic and organic phosphorus (P) and nitrogen (N), but also of other compounds such as heavy metals. They are therefore able to use compounds such as nitrate, ammonium, phosphate and carbon compounds as nutrients. In this work, a combined treatment for the degradation of glyphosate was proposed, consisting in photocatalysis and microalgal treatment applied in series. TiO_2 was used as heterogeneous photocatalysts, and the Chlorella microalga was inoculated in the pretreated solution after the photocatalytic treatment. Results showed that the biological treatment enhances the previous partial oxidation achieved with photocatalysis, achieving global removal efficiencies higher than single-separated processes. With this work, we demonstrated that photocatalysis and microalgae represent an effective and eco-friendly combined treatment for glyphosate-polluted wastewaters.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

glyphosate | photocatalysis | microalgae | combined treatment

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