

Impact of Biodegradation and Zonation on the Toxicity of Effluent from Industrial Textiles

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Abstract

This study investigated the impact of biodegradation and zonation on the toxicity of effluent from industrial textiles. The effluent was collected from a textile unit in Karaikudi, India, and its toxicity was assessed using the Microtox® bioassay. The results showed that the effluent had a high toxic potential, with a maximum inhibition concentration (IC₅₀) of 10 mg/L. The effluent was found to contain various organic pollutants, including dyes and auxiliaries, which contribute to its toxicity. The study also examined the effect of biodegradation on the toxicity of the effluent. The results indicated that the toxicity of the effluent decreased significantly after 10 days of biodegradation, suggesting that the organic pollutants present in the effluent were partially degraded during this period. The study also explored the relationship between the toxicity of the effluent and its chemical composition. The results showed that the toxicity of the effluent was highest in the initial stages of the process, where the concentration of organic pollutants was highest. As the process progressed, the concentration of organic pollutants decreased, resulting in a decrease in the toxicity of the effluent. The study also examined the effect of zonation on the toxicity of the effluent. The results indicated that the toxicity of the effluent was highest in the initial stages of the process, where the concentration of organic pollutants was highest. As the process progressed, the concentration of organic pollutants decreased, resulting in a decrease in the toxicity of the effluent.

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aquatic organisms exposed to the treated effluent. This suggests that the microbial activity effectively metabolized organic pollutants, resulting in a less toxic effluent. Additionally, the biodegradation process may have facilitated the degradation of complex organic molecules into simpler, less harmful compounds. Similarly, ozonation proved to be an effective method for reducing toxicity in the industrial textile effluent.

The oxidative properties of ozone facilitated the breakdown of organic pollutants, leading to a decrease in toxicity levels. The generation of reactive oxygen species during ozonation likely contributed to the degradation of toxic compounds, resulting in a safer effluent.

Comparing the two treatment methods, it was observed that ozonation generally resulted in a more rapid reduction in toxicity compared to biodegradation. This could be attributed to the faster reaction kinetics of ozone with organic pollutants, as well as the ability of ozonation to target a broader range of contaminants. However, biodegradation may offer long-term benefits in terms of sustainability and cost-effectiveness, as it relies on natural microbial processes. Furthermore, the study highlighted the importance of considering the potential formation of by-products during treatment processes. While both biodegradation and ozonation effectively reduced toxicity, there is a need to assess the formation of secondary pollutants to ensure the overall environmental safety of the treated effluent [6-10].

C. Conclusion

In conclusion, the findings of this study demonstrate the effectiveness of both biodegradation and ozonation in reducing the toxicity of effluent while