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Evaluation of diallyl phthalate biodegradation mechanisms in the treatment of synthetic wastewater

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Phthalic acid esters including Diallyl Phthalate (DAP) which commonly named as phthalates are considered as top priority and hazardous pollutants and have been received significant concerned over the last decades. In this study, performance of Moving Bed Biofilm Reactor (MBBR) for biological removal of DAP from synthetic wastewater was evaluated. The effects of different operation conditions including: Hydraulic retention time, DAP loading rate and aeration rate on process were investigated. In optimum conditions, 93.85% removal efficiency were achieved for DAP. Moreover, MBBR achieved to remove about 92.44% of COD. The results showed that DAP had a high biodegradation, according to the selected parameters such as half saturation constant, overall reaction rate and maximum specific growth rate. The Stover-Kincannon and second order (Grau) models were found as the best models for designing and predicting MBBR performance due to their high co-efficient of determination which were 0.98 and 0.99, respectively. The main metabolites were phthalic acid and catechol which can demonstrate that side ester chains (de-esterification) detachment is the main microbial degradation pathway. Finally, the remained benzene ring was broken to 2-hydroxy muconic semi-aldehyde. According to the bio-degradation pathway and metabolites produced, MBBR process can be considered as a reliable way for treating DAP wastewater.

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