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Immobilized microalgae using alginate for wastewater treatment

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Abstract

Organic and inorganic substances are released into the environment because of domestic, agricultural, and industrial activities which contribute to the pollution of water bodies. Removal of these substances from wastewater using conventional treatment involves high energy cost for mechanical aeration to provide oxygen for aerobic digestion system. During this process, the aerobic bacteria rapidly consume the organic matter and convert it into single cell proteins, water, and carbon dioxide. Alternatively, this biological treatment step can be accomplished by growing microalgae in the wastewater. Chlorella vulgaris immobilized in calcium alginate was used to study the removal efficiency of main nutrients in wastewater such as ammonium and phosphate that act as an important factor in microalgae growth. The immobilized cells demonstrated higher percentage of ammonium and phosphate removal of 83% and 79% respectively, compared to free-suspended cells (76% and 56%). COD removal recorded was 89% and 83% for immobilized cells and free-suspended cells, respectively. The kinetics parameters of nutrients removal for immobilized C. vulgaris in synthetic wastewater were also determined. The specific ammonium removal rates (R_A) and phosphate removal rates (R_P) for Chlorella vulgaris in synthetic wastewater were 8.3 $mg.L^{-1}day^{-1}$ and 7.9 $mg.L^{-1}day^{-1}$, respectively. On the other hand, the kinetic coefficient for each nutrient removal determined were k_A = 0.0462 $L.mg^{-1}$ day^{-1} NH_4 and k_P = 0.0352 $L.mg^{-1}$ day^{-1} PO^{3-} 4 . This study proves the application of immobilized microalgae cells is advantageous to the wastewater treatment efficiency. Furthermore, optimization on the immobilization process can be conducted to further improve the nutrients removal rates which potentially can be applied in the large-scale wastewater treatment process. © Universiti Putra Malaysia Press.

Alginate; Ammonium removal; Cell immobilization; COD; Microalgae; Nutrients removal; Phosphate removal

Reaxys Chemistry database information

Substances

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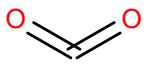

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Ammonium

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Calcium alginate

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Topic name

Photobioreactors; Nutrient Removal; Scenedesmus

Prominence percentile

99.771

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