

Biofiltration kinetics of ethylacetate and xylene using sugarcane bagasse based biofilter

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Abstract

Biodegradation kinetic behaviors of ethyl acetate and xylene in a sugarcane bagasse biofilter were investigated. Microbial growth rate, biochemical reaction rate and kinetic analysis were inhibited at higher inlet concentration. For the microbial growth process, the microbial growth rate of ethyl acetate was greater than that of xylene in the inlet concentration range of 0.2 - 1.2 g.m⁻³. The degree of inhibitive effect was almost the same for ethyl acetate and xylene in this concentration range. The half-saturation constant K_s values of ethyl acetate and xylene were 1.8489 and 1.784 g.m⁻³, respectively. The maximum reaction rate V_m values of ethyl acetate and xylene were 0.8073 and 0.8438 g C h⁻¹ kg⁻¹ packed material, respectively at a concentration of 0.2 g.m⁻³. For the biochemical reaction process, the biochemical reaction rate of ethyl acetate was greater than that of xylene in the inlet concentration range of 0.2 - 1.2 g.m⁻³. The inhibitive effect for ethyl acetate was more pronounced than that for 0.2 - 1.2 g.m⁻³ in this concentration range. The EAX concentration profiles along the depth were also determined by using diffusion reaction model. It was observed that at low concentration and low flow rate, the model is in good agreement with the experimental values for ethylacetate and xylene.

Keywords: Xylene, ethyl acetate, sugarcane bagasse, biofilter, biochemical reaction

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