

能源和环境工程

移动床生物膜法处理垃圾渗滤液COD降解动力学

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摘要 采用移动床生物膜反应器间歇处理城市垃圾渗滤液,并建立了其COD降解的动力学模型。试验结果表明,模型能够很好地描述渗滤液COD的好氧降解过程,其中动力学参数 K_2 可用来指示基质的降解速率, S_n 可用作渗滤液可生化性和可降解程度的评价指标。在不同底物浓度下模拟出的参数 K_2 和 S_n 均与底物浓度 S_0 呈线性关系。在不同填料填充比下的拟合结果表明动力学参数 K_2 与生物量浓度无关。两级MBBR串联运行能够有效处理该垃圾渗滤液,当总HRT为4 d,平均COD去除率达89.24%,其出水COD平均为 $452.10 \text{ mg} \cdot \text{L}^{-1}$,与模型得出该进水浓度下含有的惰性COD相近,直接证明了模型对评价该渗滤液可生化性具有较高的可靠性。

关键词 [动力学模型](#); [垃圾渗滤液](#); [生物膜](#); [移动床](#); [可生化性](#)

分类号

Kinetics of COD degradation in landfill leachate treatment using moving-bed bioreactor

Abstract

Batch tests were carried out to investigate the COD degradation of landfill leachate by using a moving-bed bioreactor (MBBR), and a modified bio-kinetic model was established to describe the biological reaction. The experimental results showed that the model could describe the biodegradation of leachate, and the kinetic parameter K_2 could be used as indicator of degradation rate and S_n could be used to estimate the biodegradability of leachate. The simulations under different initial leachate concentrations found that K_2 and S_n were linear to the initial leachate concentration S_0 . The data of different bio-carrier volumes also perfectly conformed to the model and further proved that the kinetic parameters in the model were independent of the biomass. The continuous operation of two MBBR in series could effectively remove the landfill leachate, when the total hydraulic retention time (HRT) was 4 d, the average COD removal efficiency was 89.24% and the effluent COD was about $452.10 \text{ mg} \cdot \text{L}^{-1}$, which was similar to the predicted value by the model under the same initial concentration. The performance of two MBBR in series gave a direct proof of the reliability of the model that was used to estimate the biodegradability of leachate.

Key words [kinetic model](#) [landfill leachate](#) [biofilm](#) [moving-bed bioreactor](#) [biodegradability](#)

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