

分离工程

超滤膜分离工艺处理大豆乳清蛋白废水的效能

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摘要

为考察膜分离技术处理大豆乳清蛋白废水的效能及其运行特征,采用再生纤维膜(RC)和聚醚砜膜(PES)进行试验,每种膜的截留分子量(MWCO)分别选定为5000、10000和30000。试验考察了各种膜的渗透通量、膜衰减系数、蛋白截留率、总糖透过率随时间的变化情况,结果表明:截留分子量为10000的RC超滤膜,在渗透通量、蛋白截留率、总糖透过率、膜衰减系数等方面皆优于其他超滤膜。超滤的最佳工艺条件为压力30kPa、pH值9、浓缩比3:1、温度20℃,膜渗透通量 $31.2 \text{ L} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$,蛋白截留率78.46%,蛋白含量51.37%。在曲线拟合和BP神经网络的基础上,建立了不同条件下膜渗透通量随时间变化的数学模型,模型模拟结果与试验结果基本一致,这说明基于曲线拟合和BP神经网络建立模型是可行的。

关键词

[大豆乳清蛋白废水](#) [超滤](#) [膜渗透通量](#) [蛋白含量](#) [曲线拟合](#) [BP神经网络](#)

分类号

Performance of ultrafiltration membrane technology in treatment of soy whey wastewater

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Abstract

The capability and process characteristics of ultrafiltration membrane technology treating soy whey wastewater were investigated by using regenerated fiber membrane (RC) and PES membrane (PES) with molecular weight cutoff (MWCO) of 5000, 10000 and 30000, respectively. The permeation flux, membrane attenuation coefficient, rejection rate of protein, carbohydrate permeation rate of all kinds of membranes were studied through the test. The results showed that by comprehensively considering flux, decline factor, protein rejection coefficient and carbohydrates permeation rate, RC-10000 was the suitable membrane for separating soybean whey. The experimental results demonstrated that the optimal operation pressure of ultrafiltration membrane was 30 kPa, the optimal pH was 9, concentration ratio was 3 : 1, and temperature was 20℃. The permeation flux was $31.2 \text{ L} \cdot \text{m}^{-2} \cdot \text{h}^{-1}$ and rejection rate of protein and protein content were 78.46% and 51.37%, respectively. In order to optimize operation parameters and predict the permeation flux of the ultrafiltration membrane for soy whey wastewater treatment, a simulation model of operation parameters was established based on curve fitting and back-propagation neural network (BPNN). Simulated results by the simulation model analysis were basically consistent with experimental values. This indicated that the simulation model on the basis of curve fitting and BPNN was practical.

Key words

[soy whey wastewater](#) [ultrafiltration membrane technology](#) [membrane permeation flux](#) [protein content](#) [curve fitting](#) [back-propagation neural network](#)

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