

分离工程

陶瓷膜通道相互作用的实验分析及CFD优化

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摘要

提出陶瓷膜过滤时, 通道之间存在3种效应关系(壁厚效应、干扰效应、遮挡效应), 并用实验进行了验证。对于多通道陶瓷膜构型的设计, 要考虑3种效应。膜孔径小于200 nm的陶瓷膜, 可以增大其通道的排布密度, 通过提高装填密度可以提高单位体积的处理量; 膜孔径大于500 nm的陶瓷膜, 中间的通道对通量几乎没有贡献, 提高装填密度意义不大。固定膜元件的外径, 选取通道直径 a_c 和壁厚 a_w , 并设定两参数的比值为 α , 采用计算流体力学

(CFD) 软件进行模拟计算, 获得了通量与处理量随孔径与 α 值的变化关系。

关键词 [陶瓷膜](#) [纯水通量](#) [CFD](#) [构型](#)

分类号

Experimental investigation of effects of ceramic membrane channels on flux and optimization with CFD

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Abstract

There are three effects in the ceramic membrane filtration process, wall thickness effect, interfering effect, sheltering effect, and these effects are validated by experiments. When mean pore size of membrane is less than 200 nm, flow by volume is increased by enhancing loading density. When mean pore size of membrane is more than 500 nm, the contribution of middle channel to the total pure water flux (PWF) of ceramic membranes can be neglected, and it is no use to enhance loading density. It is assumed that the diameter of membrane module was unchanged, and defined channel diameter a_c , thickness of the wall a_w , and set α as the ratio of a_c and a_w . The relationship between flux, flow, mean pore size and α was acquired by numerical simulation with CFD software.

Key words

[ceramic membrane](#) [pure water flux](#) [CFD](#) [configuration](#)

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