

超滤膜深度处理染整废水的膜污染机理

Fouling mechanism in advanced treatment of dyeing wastewater by ultrafiltration membrane

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中文摘要:

实验采用不同规格和材料的超滤膜进行染整二级尾水分离实验,对超滤膜污染机理及影响因素进行了分析。实验采用红外光谱分析了聚醚(PES)膜、聚砜(PSF)膜和聚醚酰亚胺(PEI)膜3种超滤膜材料,对比了污染前后膜面的接触角以及不同切割分子量对膜通量及出水水质的影响,并利用线性化的Herman堵塞模型拟合了不同分子量超滤膜的堵塞模型,初步探讨了超滤膜的污染机理。实验结果表明,膜材料表面亲水性基团的多少与初始膜通量大小成正比,出水COD值随超滤膜切割分子量减小而减小。切割分子量同为2 000 Da的3种超滤膜中,PES膜的处理效果最佳,出水COD平均值为47.81 mg/L;PEI膜通量最高,平衡通量可达50 L/(m²·h);切割分子量为1 000、10 000的超滤膜堵塞机理符合滤饼过滤模型,100 000的超滤膜堵塞机理更接近于完全堵塞模型;1 000的聚醚砜材质膜(PES)更适合此类废水的深度处理。

英文摘要:

The fouling mechanism and impact factors of ultrafiltration (UF) membrane with various membrane materials and types for the dyeing wastewater secondary effluent were analyzed. The membrane materials were analyzed with the ftir spectrum (FTIR) and the contact angles of virgin and fouled membranes with polyethersulfone(PES), polysulfone(PSF) and polyetherimide(PEI) were compared. The effects of molecular weight cut off (MWCO) on the membrane flux were investigated in the UF experiment. The membrane fouling mechanism was discussed primarily by fitting to the linearized Herman's blocking models. The results show that the hydrophilic group on the surface of the membrane material is in direct proportion with the size of the initial flux. COD concentration of permeate decreases with the decreasing of MWCO of UF membranes. Among the three membranes with different materials, the separation efficiency of PES is the highest with effluent COD 47.81 mg/L. The membrane flux of PEI is the highest which reaches 50 L/(m²·h). Cake filtration model is more adequate to represent 1 000 and 10 000 UF membrane for the relation of flux-time, whereas the completely blocking model describes is better for 100 000 UF membrane. It is found that 1 000 (PES) is more suitable for advanced treatment of this kind of dyeing wastewater.

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