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超临界水氧化处理垃圾渗滤液的响应面法优化

Optimization of supercritical water oxidation for landfill leachate treatment by response surface methodology(RSM)

关键词：垃圾渗滤液 超临界水氧化 响应面法

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摘要：在间歇式反应釜上采用超临界水氧化法处理垃圾渗滤液.运用中心组合设计研究了反应温度（400~500 ℃）、压力（24~28 MPa）、反应时间（5~10 min）和氧化系数（1.5~2.5），以及它们的交互作用对COD、氨氮去除率的影响，同时通过响应面法分析拟合出COD、氨氮去除率的二次回归方程，得到最优工艺条件.结果表明，各因素对COD去除率的影响主次作用排序为：反应压力>温度>氧化系数>反应时间；各因素对氨氮去除率的影响主次作用排序为：反应温度>压力>氧化系数>反应时间，而影响因素之间的交互作用对两者去除效果的影响却不明显.所得拟合方程对COD、氨氮去除率的预测误差分别小于±4%、±9%.拟合方程所得最佳实验条件为：时间5 min、温度496.05 ℃、压力27.69 MPa、氧化系数2.44，此时COD的去除率可以达到98.31%、氨氮去除率可以达到95.69%.

Abstract：The landfill leachate was treated by supercritical water oxidation technology with a batch reactor. Central composite design (CCD) experiment was used to evaluate the effects of temperature (400~500 ℃), pressure (24~28 MPa), oxidation coefficient (1.5~2.5), residence time (5~10 min) and their interactive effects on COD and NH_4^+-N removal efficiencies, and the quadratic regression models were obtained by the response surface analysis. Results indicated that the effects on COD removal efficiency were in the order: pressure> temperature> oxidation coefficient> residence time, and that the order on NH_4^+-N removal efficiency were temperature> pressure> oxidation coefficient> residence time. The interactive effects on both COD and NH_4^+-N removal efficiencies were not significant. The forecast error of the quadratic regression models on COD and NH_4^+-N removal efficiencies were less than ±4% and±9%, respectively. The optimum parameters within the experimental range were: 496.05 ℃, 27.69 MPa, oxidation coefficient of 2.44 and residence time of 5 minutes. Under the optimized conditions, the COD and NH_4^+-N removal efficiency can reach 98.31% and 95.69%, respectively.

Key words：landfill leachate supercritical water oxidation response surface methodology

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