

NaCl改性人造沸石去除废水中氨氮的性能及其影响因素

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Performance of NaCl-Modified Artificial Zeolite in Removing Ammonia Nitrogen From Wastewater and Its Influencing Factors

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摘要

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摘要 采用NaCl溶液对人造沸石进行改性处理, 考察NaCl溶液浓度对改性效果的影响。通过表面特征分析、静态吸附试验及吸附等温分析, 进一步比较了人造沸石和改性人造沸石对氨氮的吸附去除性能。由X射线衍射(XRD)分析可知, 沸石经改性后表面变粗糙, 同时出现NaCl晶体特征衍射峰。试验结果表明, $1.0 \text{ mol}\cdot\text{L}^{-1}$ NaCl溶液对人造沸石的改性效果最佳; 在沸石用量为 1.0 g (50 mL 废水)、氨氮浓度为 $10 \text{ mol}\cdot\text{L}^{-1}$ 、反应时间为 40 min 、反应温度为 $25 \text{ }^\circ\text{C}$ 和pH值为 6.52 条件下, 改性人造沸石对氨氮的吸附效果最佳, 去除率为 96.02% 。Langmuir和Freundlich吸附等温方程均可较好地拟合2种沸石对氨氮的吸附过程。改性人造沸石对氨氮的吸附饱和容量($21.46 \text{ mg}\cdot\text{g}^{-1}$)远大于人造沸石($9.03 \text{ mg}\cdot\text{g}^{-1}$)。

关键词: 人造沸石 NaCl改性 吸附性能 氨氮

Abstract: NaCl solution was used to modify artificial zeolite to explore effect of concentration of NaCl on removal of ammonia nitrogen. Through surface characteristics analysis, static adsorption experiments and adsorption isotherm analysis, comparison was done between artificial zeolite and modified artificial zeolite in ammonia nitrogen adsorption. X-ray diffraction(XRD) analysis revealed that the modification made surface of the zeolite rougher, and the zeolite display diffraction peaks characteristic of NaCl crystals at the same time. The experiment demonstrated that modification of zeolite with $1.0 \text{ mol}\cdot\text{L}^{-1}$ NaCl was the best in effect. And the effect of modified zeolite adsorbing ammonia nitrogen was optimal when 1.0 g zeolite was applied to treat 50 mL of wastewater, 6.52 in pH, and containing $10 \text{ mol}\cdot\text{L}^{-1}$ of ammonia nitrogen for 40 min at 25°C , removing 96.02% of the ammonia nitrogen in the wastewater as compared to 87.18% for raw zeolite. Both the Langmuir and Freundlich isotherm equations fit well the processes of the two types of zeolites adsorbing ammonia nitrogen. The saturated ammonia nitrogen adsorption capacity ($21.46 \text{ mg}\cdot\text{g}^{-1}$) of modified artificial zeolite is much higher than that of unmodified artificial sorbent ($9.03 \text{ mg}\cdot\text{g}^{-1}$).

Keywords: artificial zeolite NaCl modification adsorption characteristics ammonia nitrogen

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