

环境科学

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潜流人工湿地处理微污染河道水中有机物和氮的净化效率及沿程变化

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英文关键词 [subsurface-horizontal flow](#) [constructed wetlands](#) [micro-polluted river water](#) [organic pollutant](#) [permanganate index](#) [N](#) [removal rate](#)

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中文摘要

以野外水平潜流芦苇砾石床人工湿地研究了湿地对微污染河道水的长期动态净化特性. 2年多的运行结果表明, 潜流湿地对污染物的去除性能存在波动、稳定过程. 潜流湿地降解有机物和脱氮性能与植物生长和季节变化相关, 其中植物生长和季节变化对湿地脱氮效能的影响大于对湿地去除有机物的影响. 潜流湿地降解有机物的主要场所随运行时间沿程推移, 启动期主要在湿地前部完成, 稳定运行期主要在湿地的前、中部完成. 湿地对有机物的去除率, 在6.10%~37.83%之间变化. 湿地运行期间, 沿程水样C/N值基本>5, 碳源供应较充足. 潜流湿地启动期TN平均去除率为15.51%, 稳定运行期TN平均去除率为8.61%, 低于启动期, 整个运行期间湿地TN去除率不足40%. 潜流湿地中硝化与反硝化反应在中部达到动态平衡, TN去除效率最高. 稳定运行期间潜流湿地的前、中部耗氧强度最大, 后部下层有明显硝化反应发生. 潜流湿地对有机物降解、硝化与反硝化反应、TN去除具有沿程同步性. 试验还初步发现, 在植物生长旺盛的春夏季根系分泌的低分子有机酸对化能自养型硝化细菌可能有较大抑制作用, 可能是影响脱氮效率提高的一个因素.

英文摘要

A subsurface- horizontal flow constructed wetlands (CWs) planted with reed was used to treat micro-polluted river water in this study with an aim to investigate the long-term treatment efficiency of CWs especially for organic C and N. Average data obtained from two-year plant growth season showed that performance of the wetlands appeared to be affected by both establishment/maturation factors and year-to-year climatic variations. The results displayed that the removal of C and N in the influent depended, to a certain extend, on plant growth and seasonal variations, especially for total N removal. It was observed that C removal occurred mainly in the front of CWs in the first-year's operation period and then was translocated to the rear end of wetlands in the second-year's operation period. C/N ratio in the influent was 5 or more, indicating enough C source supply for denitrification. Organic C removal efficiencies varied from 6.10% to 37.83% throughout the trial. Average total N removal efficiency of 15.51% in the first-year operation period and then declined to 8.61% in the second year. The highest removal efficiency of total N was below 40% throughout the two-year trial. It was found that nitrification and denitrification reached dynamic equilibrium at the middle of the wetlands where the highest total N removal efficiency occurred. The greatest oxygen consumption was observed in the front and middle of CWs. It was noted that nitrification occurred even in deep layer located in the rear end of the wetlands in the second-year operation period. Nitrification and denitrification occurred concurrently with C and total N removal along the stream way. Low- molecular-weight organic acids released from reed rhizosphere seemed to have a significant inhibitory effect on chemoautotrophic nitrifying bacteria, which involved in nitrogen removal efficiency of the wetlands, particularly during spring and autumn.

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