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改造滤岸对城市降雨径流中氮磷去除的中试研究

Pilot-scale study on the removal of nitrogen and phosphorus in urban rainfall runoff by reconstructed infiltration riparian

关键词: [城市河岸带](#) [降雨径流](#) [滤岸](#) [中试模型](#) [氮](#) [磷](#)

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摘要: 选择煤渣、锯末、沸石、麦饭石、土壤和马尼拉草构建了城市河岸带改造滤岸中试模型,并对其去除城市降雨径流中氮磷污染物能力进行了研究.结果表明,改造滤岸对表面径流和下渗径流中 $\text{NH}_4^+\text{-N}$ 和TP具有良好的净化效果和较强的去除能力; $\text{NH}_4^+\text{-N}$ 平均去除率分别为66.5%和83.7%,TP平均去除率分别为42.6%和96.2%,出水水质分别可达国家地表水IV类和III类水标准,模型稳定后对表层径流和下渗径流中TN的去除率可达20%左右;模型对 $\text{NH}_4^+\text{-N}$ 、TN和TP的处理负荷分别为 $634.1\sim 1114.5\text{ mg}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$ 、 $102.2\sim 594.2\text{ mg}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$ 和 $20.6\sim 209.0\text{ mg}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$,表面径流大于下渗径流.模型内碳源(锯末)以及其他介质的添加虽然能够提高氮的转化能力,但也会影响模型对TN的去除率;下凹断面和末端断面对氮磷的去除率和去除负荷间存在一定的差异,但随着模型的稳定其差异逐渐降低.模型对氮磷的处理负荷与入水氮磷浓度呈显著正相关,说明模型具有一定的抗冲击能力.

Abstract: A pilot-scale apparatus of reconstructed infiltration riparian was established by using coal cinder, sawdust, zeolite, medical stone and local soil, as well as *Cynodon dactylon*. Capability of this multiple-composing apparatus in removing the nitrogen and phosphorus in urban rainfall runoff was studied. Results showed that the reconstructed infiltration riparian had high removal efficiencies of ammonia ($\text{NH}_4^+\text{-N}$) and total phosphorus (TP) both in surface and infiltration runoff. The average $\text{NH}_4^+\text{-N}$ removal rates were 66.5% in surface and 83.7% in infiltration runoff, respectively, and the removal rates for TP were 42.6% and 96.2%, respectively. The concentrations of $\text{NH}_4^+\text{-N}$ and TP in the final effluent were lower than the corresponding values of the type IV and III in Chinese National Environmental Quality Standards for Surface Water (GB3838-2002). The average removal rates of total nitrogen (TN) were much lower than those of $\text{NH}_4^+\text{-N}$ and TP, and could reach about 20% when the apparatus became stabilized. The treatment load of $\text{NH}_4^+\text{-N}$, TN and TP were $634.1\sim 1114.5\text{ mg}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$, $102.2\sim 594.2\text{ mg}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$ and $20.6\sim 209.0\text{ mg}\cdot\text{m}^{-2}\cdot\text{h}^{-1}$, respectively. The removal capability of apparatus was generally higher in surface runoff than in infiltration runoff. Mediums of the apparatus could promote the transformation of nitrogen, e.g. sawdust as the carbon source, but they could also reduce the removal efficiency of TN due to the release of nitrogen from added mediums. There was obvious difference in removal rate and treatment load between the concaved section and end section. However, the difference would gradually decrease with the stabilization of the apparatus. The removal capability of the apparatus was significantly positively correlated with the nitrogen and phosphorus concentrations in influent, which indicated that the reconstructed infiltration riparian had a better pollutant loading and certain impact resistance ability.

Key words: [urban riparian zone](#) [runoff](#) [infiltration riparian](#) [pilot-scale apparatus](#) [nitrogen](#) [phosphorus](#)

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