

人工介质富集附着生物对富营养化水体的净化作用

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Effect of Periphyton in Artificial Substrate on the Purification of Eutrophicated Water

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摘要

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摘要 研究了人工介质富集附着生物对富营养化水体中藻类及氮、磷营养物质的去除特性, 以及不同水深、水体流速和溶解氧、温度、pH等理化性质对去除效果的影响。结果表明, 在静态水体条件下, 组合人工介质富集附着生物对于 $\text{NH}_4^+\text{-N}$ 、TN、TDN、 $\text{NO}_3^-\text{-N}$ 、TP、TDP和 $\text{PO}_4^{3-}\text{-P}$ 平均去除率分别为98.90%、45.15%、42.78%、38.13%、76.18%、80.11%和87.02%, 藻类叶绿素a(Chl-a)含量则降低了63.53%。随着水深的增加, 藻类Chl-a含量下降速度减缓, 但对氮、磷营养物质的去除影响不大。随着水体流速的增加, 即由静态水体转变为流速为 $200\text{ L}\cdot\text{h}^{-1}$ 的动态水体, 藻类Chl-a含量降低程度有所增加, TP和TDP去除率也有所增加, 其中, 静态和动态水体中Chl-a含量分别降低了63.53%和72.17%, TP去除率由76.18%增至85.13%, TDP由80.11%增至83.76%; TN去除率由45.15%降至32.02%, TDN由42.78%降至28.73%; 对于 $\text{NO}_3^-\text{-N}$, 静态对照去除率为38.13%, 而动态处理去除效果不佳; 而 $\text{NH}_4^+\text{-N}$ 和 $\text{PO}_4^{3-}\text{-P}$ 去除率变化不大, $\text{NH}_4^+\text{-N}$ 由98.90%变为98.59%, $\text{PO}_4^{3-}\text{-P}$ 由87.02%变为86.13%。水体DO、温度、pH等理化性质特别是 $\rho(\text{DO})$ 对净化效果亦有一定影响。

关键词: 组合介质 附着生物 藻类 叶绿素a 氮 磷 富营养化

Abstract: Features of periphytons in artificial substances for purifying eutrophicated water of algae and nutrient substances, like nitrogen & phosphorus were studied and influence of physical & chemical properties, like water depth, water flow velocity, DO, temperature and pH, on the purifying effect were analyzed. Results show that in still waterbody, the mean removal rate of $\text{NH}_4^+\text{-N}$ 、TN、TDN、 $\text{NO}_3^-\text{-N}$ 、TP、TDP、 $\text{PO}_4^{3-}\text{-P}$ was 98.90%、45.15%、42.78%、38.13%、76.18%、80.11%、87.02%, respectively, and Chl-a content decreased by 63.53%. Water depth affected the decreasing speed of Chl-a to some extent, but did not affect the removal rate of other nutrients. Water flow velocity, once increased from 0 to $200\text{ L}\cdot\text{h}^{-1}$, raised the removal rate of TP, TDP to a certain extent, from 76.18% to 85.13%; and from 80.11% to 83.76%, respectively, while Chl-a content was raised by 63.53% in still water, and by 72.17% in dynamic water. However, it lowered that of TN, TDN and $\text{NO}_3^-\text{-N}$ from 45.15% to 32.02%; from 42.78% to 28.73%; and from 38.13% to 5.26%, respectively, and did not affect much that of $\text{NH}_4^+\text{-N}$ and $\text{PO}_4^{3-}\text{-P}$ ($\text{NH}_4^+\text{-N}$: from 98.90% to 98.59%; and $\text{PO}_4^{3-}\text{-P}$: from 87.02% to 86.13%). Among the physical & chemical properties, DO was also a factor affecting the purifying effect.

Keywords: Assembled substrate periphyton algae Chl-a nitrogen phosphorus eutrophicated water

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