车 轩,刘 晃,吴 凡,倪 琦.滤料运动提高往复式微珠生物过滤器效率[J].农业工程学报,2013,29(5):194-198

滤料运动提高往复式微珠生物过滤器效率

Improve effectivity of microbead biofilter by media motion

投稿时间： 2012-06-29 最后修改时间： 2013-01-31

中文关键词：硝化反应,动力学,过滤器,微珠生物过滤器,滤料运动

英文关键词:nitritication kinetics filters microbead biofilter media motion

基金项目:国家虾产业技术体系（CARS-47）；农业部渔业装备与工程重点开放实验室开放课题（2010A03）

作者	单位
车 轩	1. 农业部渔业装备与工程技术重点实验室，上海 200092；2. 中国水产科学研究院渔业机械仪器研究所，上海 200092
刘 晃	1. 农业部渔业装备与工程技术重点实验室，上海 200092；2. 中国水产科学研究院渔业机械仪器研究所，上海 200092
吴 凡	1. 农业部渔业装备与工程技术重点实验室，上海 200092；2. 中国水产科学研究院渔业机械仪器研究所，上海 200092
倪 琦	1. 农业部渔业装备与工程技术重点实验室，上海 200092；2. 中国水产科学研究院渔业机械仪器研究所，上海 200092

中文摘要:

为确定滤料往复运动在生物滤器硝化反应过程中的作用，该研究围绕滤料运动对往复式微珠生物过滤器硝化反应效率和动力学的影响进行了试验，利用一套微珠生物滤器，填充发泡聚苯乙烯颗粒（expanded polystyrene beads，EPS）滤料，粒径为3 mm，滤料层高度26 cm，对其过滤效果进行试验。结果表明，滤料层的往复运动显著改善过滤器的处理效果，滤料的运动停止后，过滤器的效率缓慢下降，6 d后的氨氮去除负荷降低了27.1%。动力学研究结果显示，滤料运动改变了过滤器的硝化反应动力学特性，与静止状态相比，硝化反应自零级动力学向半级动力学升级的分界点显著降低，进一步证明滤料运动可以改善营养物质的传质情况，提高生物膜活性，提升过滤器效率。

英文摘要:

Conventional microbead biofilters are simple and reliable in form, but they possess certain limitations due to the thickness of the filter. Excessive filter thickness can cause channeling along the wall and even moderate to severe blockage. Water channeling detrimentally decreases the residing time of the reactants, thus leading to decreased nitrificati activity. Sequencing microbead biofilter, in which the media keeps continuous “up and down” movement, is developed on the basis of the traditional microbead filters. The brea bars are positioned in the bead bed volume in order to generate a relative displacement between microbeads, which enable the biofilter obtain the effect of self-cleaning. The investigation of effect of media layer reciprocating motion on nitritification efficiency and kinetics of this type of filter as a purpose, a pilot scale experiment was carried out in a recirculating aquaculture system. The experimental biofilter was divided into two chambers, designated A-chamber and B-chamber. The water flow through the filtration system w proceed by the electric control valve and water level switch in an alternating fashion, regularly switching between the vessels to enter the A-chamber or B-chamber. Each chambe the experimental filter was 30 cm in diameter and 50 cm height. The filter used expanded polystyrene beads (microbead) approximately 3.0 mm in diameter, with a density of 28 kg/m a specific surface area of 1160 m2/m3. The microbead packing layer was highly filled at 0.26 m, exhibiting a microbead packing volume of 0.037 m3. The filter used a pump to carry v while the water trickles down the microbead packing due to gravity. The RAS test system consisting of a 1.3 m3 culture tank, a particle trap, swirl separators, a pump sump, a reuse pump, a sequencing microbead biofilter, and an air diffuser. The bulk water was pumped from a sump to the tested filter after removing solid wastes by the swirl separator, and the returned to culture tank. The total water volume of the system was about 1.6 m3. The reciprocating motion was suspended for six days. Then resume movement of the media and compare the ammonia removal rate and nitritification kinetics in two operation conditions. The result revealed that the movement enhanced the treatment performance greatly. Six later, when the reciprocating motion was suspended, the ammonia removal efficiency exhibited a gradual decline of 27.1%. Then, the movement of the media was resumed. As a re biological filter ammonia removal efficiency increased rapidly to the level before the motion stops after two days. The results of nitritification kinetics indicate that the media move changed the kinetics characteristics of filter. Compared with that in stationary state, the threshold value from zero-order to half-order kinetics decreased significantly. The media reciprocating movement and the cutting of the flow greatly improved the hydraulics on the surface of media the mass transfer efficiency. Thereby, the biofilm activity and nitrifica the efficiency increased correspondingly.

查看全文 下载PDF阅读器

关闭