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研究报告

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纳米磁粉协同邻氨基苯酚优化活性污泥工艺运行效能研究

Optimization of the operation efficiency of an activated sludge process by the synergistic effects of nano-magnetic particles and *o*-aminophenol

关键词：邻氨基苯酚 纳米磁粉 工艺运行效能 污泥减量

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摘要：在纳米磁粉(NMPs)和邻氨基苯酚(OAP)的协同作用下,可以达到优化活性污泥工艺的运行效能和从源头上减少剩余污泥产量的目的.纳米磁粉和邻氨基苯酚被分别和同时投加到序批式反应器(SBR)中来进行实验研究.实验结果表明:在OAP的单独作用和二者协同作用下污泥产量分别减少了31%和25%.NMPs与OAP协同作用下对COD和TP的去除率比OAP单独作用下分别增加了8%和5%,出水NH_4^+-N的浓度和平均SVI值分别下降了58%和10%.连续运行36 d后,OAP和NMPs协同作用下的脱氢酶活性比对照增加了6%,镜检发现:生物反应器中活性污泥絮体结构紧密,并且存在大量种类繁多的原生和后生动物.研究结果表明,在纳米磁粉和OAP的协同作用下可有效地实现剩余污泥减量化、改善污泥的沉降性能,并能抑制仅加入解耦联剂(OAP)对活性污泥工艺效能产生的不良影响.

Abstract: This study was focused on optimizing the operation efficiency of an activated sludge process and minimizing the production of the excess sludge from its sources by utilizing the synergistic effects of nano-magnetic particles (NMPs) and o-aminophenol (OAP). The production of the excess sludge was reduced by 31% with OAP added into the sequence batch reactor (SBR), and by 25% with the co-addition of NMPs and OAP. In comparison with OAP addition only, the co-addition of NMPs and OAP elevated the removal of COD and P by 8% and 5%, respectively, while decreased the concentration of NH_4^+-N in effluent and the average SVI by 58% and 10%, respectively. After operation for 36 days, the activity of dehydrogenase in an experimental bioreactor was found to increase 6% under the synergistic action of NMPs and OAP in comparison with the control bioreactor. By using an optical microscope, it was observed that diversified protozoon and metazoan existed in the experimental bioreactor with compact sludge floc. Such results demonstrated that the combination of NMPs and OAP has an obvious synergistic effect in effectively restricting the production of excess sludge, improving the settling property of sludge, and reducing the negative effect to the operation of an activated sludge process with adding OAP only.

Key words: OAP nano- magnetic particles process performance volume-reduction of the excess sludge