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基于PHB碳源驱动的同时硝化/反硝化除磷过程

Intracellular storage polymer (PHB)-driven simultaneous nitrification/denitrification phosphorus removal (SNDPR)

关键词：城市污水 同时硝化/反硝化除磷(SNDPR) 曝气模式 PHB ORP和pH

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摘要：构建厌氧/限氧曝气的序批式生物系统（A/OLASBR），以碳源偏低模拟城市污水为对象，在连续（CA）和间歇曝气（IA）模式下，研究以PHB为碳源驱动的同时硝化/反硝化除磷（SNDPR）过程，并考察了PHB、氧化还原电位（ORP）和pH值的变化规律与SNDPR持续稳定性之间的关系.结果表明，在恒定气量为40 L·h^{-1}的CA模式下TN和TP去除率分别为79.9%和92.8%；而IA模式下曝气百分数（AF）和曝气频率（f_{IA}）值为0.5和24时，TN与TP去除率分别为87.9%和93.5%，PHB降解速率平稳，ORP均值均化程度最好，ORP和pH值的稳定性最强.因此，低AF和高f_{IA}的IA模式可缓冲PHB降解速率，均衡硝化与反硝化除磷速率，有利于SNDPR过程的持续稳定，且ORP均值的均化程度与ORP和pH值的稳定性可控制SNDPR过程的持续稳定.

Abstract：The present paper reports the results of the application of anaerobic/oxygen limited aeration sequencing batch reactor (A/OLASBR) in low carbon municipal wastewater treatment under the continuous aeration (CA) and intermittent aeration (IA) modes. The process of intracellular storage polymer (PHB)-driven simultaneous nitrification and denitrification phosphorus removal (SNDPR) was studied and the relationship between the PHB, ORP, pH values and the stability of SNDPR was analyzed. The results show that 79.9% of TN and 92.8% of TP were removed at 40 L·h^{-1} air flux in CA mode. 87.9% of TN and 93.5% of TP were removed in IA mode with aeration fraction of 0.5 and high air-on frequency of 24. Meanwhile, the stable degradation rate of PHB, the best average level of ORP and stability of ORP and pH values were achieved. These results suggest that IA with small aeration fraction and high air-on frequency can cushion the degradation rate of PHB, and balance between nitrification rate and denitrification phosphorus removal rate. This also could be helpful for the stable process of SNDPR. The fluctuation range of average level of ORP and the stability of ORP and pH values may control the stability of SNDPR process.

Key words：municipal wastewater simultaneous nitrification and denitrification phosphorus removal (SNDPR) aeration mode PHB ORP and pH