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SBR中缺氧颗粒污泥反硝化过程中PHB的存储与利用

Storage and utilization of poly- β -hydroxybutyrate under denitrification in an anoxic granular sludge SBR

关键词: [SBR](#) [反硝化](#) [颗粒污泥](#) [PHB](#)

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摘要: 微生物在非平衡的生长条件(暂态)下,存储胞内聚合物是去除易生物降解有机物的一种机制,这种现象对不同微生物种群在暂态下的基质竞争有着重要意义.本试验采用SBR反应器以乙酸为基质,在缺氧条件下成功培养出颗粒污泥,在此基础上对乙酸的消耗以及胞内聚合物聚- β -羟基丁酸(PHB)的合成与利用进行研究.结果表明:间歇条件下,颗粒污泥中反硝化菌对基质的利用存在着储存机制.日常运行周期内当基质较多时,颗粒污泥中PHB含量上升,基质缺乏时,PHB含量衰减,周期末端PHB含量为0.75%~1.0%;PHB合成阶段, $\Delta\text{PHB}/\Delta\text{COD}$ (即 Y_{STOD})为0.39,最大合成比速率为 $0.124\text{g}\cdot\text{g}^{-1}\cdot\text{h}^{-1}$,且 $\Delta\text{COD}/\Delta\text{NO}_x\text{-N}$ 的比值可间接反映出PHB的变化状态;进水 $\text{COD}/\text{NO}_3\text{-N}(\text{C}/\text{N})=5$ 提高基质负荷情况下,周期内PHB变化情况与日常运行条件下相似, Y_{STOD} 为0.35~0.25;进水 $\text{C}/\text{N}=7.5$ 时,乙酸供给富余,反硝化过程中缺氧颗粒污泥PHB含量不断升高,直至反应结束, Y_{STOD} 为0.38~0.45.

Abstract: Storage of internal polymers is considered one mechanism for the removal readily biodegradable organic matter for microorganisms under dynamic (transient) conditions and this phenomenon is very important for substrate competition of different cultures under transient conditions. In this study, anoxic granular sludge was successfully cultivated with acetate as substrate under anoxic conditions in an SBR and the processes of acetate consumption, storage and utilization of the internal polymer, poly- β -hydroxy butyrate (PHB), were studied. Denitrobacteria used the acetate substrate in a storage mechanism process. The PHB content of granular sludge initially increased while substrate was available and then decreased in the following substrate-deficient stage of the daily operation cycle. The PHB content could reach as high as 0.75%~1.0% of the biomass by the end. During the PHB synthesis phase, $\Delta\text{PHB}/\Delta\text{COD}$ (Y_{STOD}) was 0.39, the maximum synthetic rate was $0.124\text{g}\cdot\text{g}^{-1}\cdot\text{h}^{-1}$ and storage or utilization of PHB could be reflected indirectly by the ratio of $\Delta\text{COD}/\Delta\text{NO}_x\text{-N}$. When the substrate load was raised such that the $\text{COD}/\text{NO}_3\text{-N}(\text{C}/\text{N})$ ratio was 5, the PHB content of the biomass showed a trend very similar to that of the typical daily operation cycle and Y_{STOD} was 0.35~0.25. When C/N ratio was increased to 7.5, concentrations of PHB were raised continually until the end of denitrification and Y_{STOD} was 0.38~0.45 due to sufficient substrate supply.

Key words: [SBR](#) [denitrification](#) [granular sludge](#) [poly- \$\beta\$ -hydroxybutyrate](#)

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