

能源和环境工程

## 活性污泥系统比耗氧速率在线检测与变化规律

李凌云, 彭永臻, 李论, 王淑莹

北京工业大学北京市水质科学与水环境恢复工程重点实验室, 北京 100124

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摘要

为了研究活性污泥微生物代谢活性和基质降解效率, 建立了一种在线测量SBR工艺比耗氧速率(SOUR)的方法, 并考察了活性污泥系统SOUR在有机物降解与氨氧化过程中的变化规律。结果表明: 无论在恒定DO还是在恒定曝气量条件下, SOUR曲线上均先后出现了溶解性COD降解、氨氮氧化和内源呼吸3个阶段。由于异养菌竞争溶解氧相对于硝化细菌占据优势, 导致先去除COD后氨氧化。当恒定DO为 $1.0 \text{ mg} \cdot \text{L}^{-1}$ 时, 异养菌降解COD的SOUR为 $0.36 \text{ mg O}_2 \cdot (\text{g MLSS})^{-1} \cdot \text{h}^{-1}$ ; 氨氧化过程中, 硝化细菌的SOUR为 $0.18 \text{ mg O}_2 \cdot (\text{g MLSS})^{-1} \cdot \text{h}^{-1}$ , 当氨氧化结束时, SOUR骤降, 该现象表明氨氮到 $\text{NO}_2^-$ 阶段的氧化结束, 此时系统应停止曝气, 防止 $\text{NO}_2^-$ 进一步氧化为 $\text{NO}_3^-$ , 因此通过SOUR的指示作用可以实现短程硝化启动与维持。

关键词

[SBR工艺](#) [比耗氧速率](#) [自动控制](#) [溶解氧](#) [在线检测](#)

分类号

## On-line determination and variations of specific oxygen uptake rate in activated sludge system

LI Lingyun, PENG Yongzhen, LI Lun, WANG Shuying

### Abstract

In order to investigate the metabolic activity of microorganisms and the rate of substrate degradation during the aerobic biological treatment, a method of on-line determination of specific oxygen uptake rate (SOUR) in the sequencing batch reactor (SBR) process was established. The trends of SOUR in the organic matter degradation and ammonium oxidation processes were investigated. It was shown in the SOUR profiles that the system underwent three stages under either constant DO concentration or airflow rate conditions, i.e. deliquescent COD degradation, ammonium oxidation and endogenous respiration. The heterotrophic bacteria showed a higher DO affinity compared with the autotrophic bacteria, thereby resulting in COD removal firstly and subsequent nitrification. SOUR was  $0.36 \text{ mg O}_2 \cdot (\text{g MLSS})^{-1} \cdot \text{h}^{-1}$  during the COD degradation, and  $0.18 \text{ mg O}_2 \cdot (\text{g MLSS})^{-1} \cdot \text{h}^{-1}$  during the ammonia oxidation at the constant DO concentration of  $1.0 \text{ mg} \cdot \text{L}^{-1}$ . SOUR declined sharply when ammonia oxidation was completed, which indicated completion of the partial nitrification process. Aeration should be terminated to avoid further oxidation of nitrite to nitrate. Accordingly, initiation and maintenance of the partial nitrification process can be realized by identifying the slope of SOUR profile.

Key words

[SBR process](#) [specific oxygen uptake rate](#) [automatic control](#) [DO](#) [on-line determination](#)

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通讯作者 彭永臻 [pyz@bjut.edu.cn](mailto:pyz@bjut.edu.cn)