Achieving nitritation for low-strength wastewater at different temperatures in an aerobic cubic sponge reactor under high dissolved oxygen

Dongbo Liang\textsuperscript{a}, Wei Bian\textsuperscript{a}, Wenxiao Wang\textsuperscript{b}, Qing Zhao\textsuperscript{a}, Yiqi Sun\textsuperscript{a}, Yaodong Wu\textsuperscript{a}, Jun Li\textsuperscript{a,}\textsuperscript{*}

\textsuperscript{a}National Engineering Laboratory of Urban Sewage Advanced Treatment and Resource Utilization Technology, College of Architecture and Civil Engineering, Beijing University of Technology, Beijing 100124, China, Tel. +86 13611249208; email: bjutlijun@126.com (J. Li); Tel. +86 18811424322; email: bjutliangdongbo@163.com (D. Liang); Tel. +86 15811418433; email: yangzhoubw@163.com (W. Bian); Tel. +86 17710664450; email: 374343833@qq.com (Q. Zhao); Tel. +86 18811718992; email: 1037902374@qq.com (Y. Sun); Tel. +86 18811228300; email: 1097450598@qq.com (Y. Wu)

\textsuperscript{b}Beijing Enterprises Water Group Ltd., Beijing 100024, China, Tel. +86 13691022490; email: 464078588@qq.com

Received 5 April 2018; Accepted 31 October 2018

\textbf{A B S T R A C T}

The application of nitritation in domestic wastewater treatment is very meaningful. In this study, nitritation for low-strength wastewater in a moving bed biofilm reactor was achieved at different temperatures (25°C, 20°C, 15°C and 10°C) under high dissolved oxygen. Partial nitritation was achieved with aerobic flow-separated ball filling cubic sponges through sequencing batch feed mode even at temperature of 10°C. Results indicated that the negative effects of the decrease in temperature on nitritation can be compensated by positive operation conditions, such as reducing hydraulic residence time to improve effluent concentration of ammonia. The contribution of aerobic flow-separated ball to nitritation recovery is due to the enhanced internal oxygen inhibition on nitrite oxidizing bacteria (NOB) without negatively affecting reaction efficiency. Improving effluent concentration of ammonia under continuous mode is also beneficial for internal oxygen repression on NOB meanwhile free ammonia inhibition on NOB is strengthened. Hysteretic growth of NOB compared to ammonia-oxidizing bacteria (AOB) in each cycle should be the main reason for the superiority of sequencing batch feed mode to recover nitritation. The finding that nitritation fails more slowly at lower temperature is good for maintaining stable nitritation at low temperature because we can find the nitrification deterioration in time.

\textit{Keywords:} Biofilm; Nitritation; Low-strength wastewater; High dissolved oxygen; Different temperatures

* Corresponding author.

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