Using the method of wastewater acidification to improve the efficiency of carbon utilization and nutrient removal in A2N process from a lab-scale operation

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\textbf{ABSTRACT}

Many wastewater treatment processes were developed in order to avoid excessive discharge of nitrogen (N) and phosphorous (P) into the downstream water bodies to mitigate their eutrophication problems. However, one of common problems for these processes is that there is no sufficient carbon source for denitrification. In this research, a continuous anaerobic–anoxic–nitrification process, which was based on reaction of denitrifying phosphorous removing bacteria, was tested to improve carbon utilization and nutrient removal from sewage by employing the method of wastewater acidification. The results have presented that different acidification times could cause remarkable changes in the carbon transformation and utilization. The volatile fatty acids concentration has increased by 56.26 ± 2.46 mg/L during the period of 24-h acidification. Accordingly, the efficiency of carbon source utilization in the anaerobic and anoxic reactors increased by 21.21% and 25.03%, leading to the final removing efficiency of 80.53% total nitrogen and 92.37% total phosphorus, respectively. The effluent water quality could meet the Chinese Discharging Standards for Urban Waste-water Treatment Plants (GB18918–2002) grade A after 8-h acidification. It seemed that acidification had no significant influence on the internal transformation between Glycogen and Poly-β-hydroxybutyrate. Particulate organic carbon was found to be an important potential carbon source, and the removal efficiency of chemical oxygen demand showed no obvious relationship with acidification time as well.

\textbf{Keywords:} Carbon source; Acidification; Volatile fatty acids; Poly-β-hydroxybutyrate; Glycogen; Anaerobic–anoxic–nitrification; Denitrifying phosphorous removing bacteria

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