Improving anoxic/aerobic nutrients removal by the enhanced biological phosphorus removal-sulfur autotrophic denitrification (EBPR-SAD) system when treating low C/N ratio municipal wastewater

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A novel nutrients removal system integrating enhanced biological phosphorus removal (EBPR) and sulfur autotrophic denitrification (SAD) was developed to upgrade the Shenyang Degremont Anoxic Oxic process (SDAO). In this system, the EBPR process was mainly employed to utilize organic carbon for denitrification and phosphorus removal; the SAD process was used to remove nitrate, which was not removed in the EBPR process because of a low C/N ratio. The results showed that the EBPR-SAD effluent COD, TN, NH$_4^+$–N and TP were 24.6, 1.21, 1.09 and 0.24 mg/L, respectively. Compared with those of the original system, the removal efficiencies of TN and TP increased to 95.8% and 86.9%. It was demonstrated that the EBPR-SAD system could achieve nearly complete nutrients removal from low C/N ratio municipal wastewater. Cluster analysis and principal coordinate analysis showed that bacterial community structures were significantly different between SDAO, EBPR and SAD processes, indicating that bacterial community structures were affected by the type of wastewater biotreatment system. Taxonomic analysis showed that the nine most abundant phyla in the SDAO and EBPR-SAD system accounted for 87.0%–90.7% of the total effective sequences. Redundancy analysis was used to reveal the relationship between the abundance of bacterial phyla and environmental parameters in the SDAO and EBPR-SAD system.

Keywords: EBPR-SAD system; Low C/N ratio wastewater; Efficient nutrients removal; Material balance calculation; High-throughput sequencing; Redundancy analysis

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