



High phosphorus shock loading induced glycogen accumulating organisms in anaerobic/oxic sequencing batch reactor

Chih-Hsun Hsu^a, Wei-Chin Chang^{b,*}, Jian-Jyun Chen^b, Jhong-Syun Wu^b

^aGraduate School of Engineering Science and Technology, National Yunlin University of Science and Technology, Yunlin 64002, Taiwan

^bDepartment of Safety, Health and Environmental Engineering, National Yunlin University of Science and Technology, Yunlin 64002, Taiwan

Tel. +886 05 5342601x4422; Fax: +886 05 5312069; email: changwc@yuntech.edu.tw

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ABSTRACT

This study investigated the long-term adaptability of an acetate-fed anaerobic–oxic sequencing batch reactor, operated at 15 days of solid retention time (SRT), to the influent P/COD loading raised from 15/400 to 40/400 mg/mg. Experiment results showed that after four SRTs operation, the anaerobic P release, aerobic P uptake and sludge P content decreased apparently, implying the metabolism of phosphate-accumulating organisms (PAOs) was inhibited. In contrast, anaerobic glycogen consumption and polyhydroxyalkanoates (PHAs) accumulation per acetate uptake increased observably, and 3HV/PHAs ratio elevated gradually to 21.8%. These results indicated that the proliferation of glycogen-accumulating organisms (GAOs) was encouraged. When influent phosphorus was reduced back to 15 mg/L, sludge P content diminished and a low P release/acetate uptake ratio was achieved, suggesting that PAOs' metabolism was not restored. The above findings concluded that long-term operation of the high phosphorus influent inhibited the proliferation of PAOs, and more importantly provided GAOs a competitive advantage over PAOs.

Keywords: Phosphorus removal; Phosphate-accumulating organisms; Glycogen-accumulating organisms; Biological treatment; High phosphorus loading

*Corresponding author.