Nitrogen and phosphorus removal in a novel extra-loop fluidized bed bioreactor (EFBBR)

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ABSTRACT

The performance of a novel extra-loop fluidized bed bioreactor (EFBBR) in sequencing batch reactor mode (total 12 h: anaerobic 1.5 h, aerobic 5 h, anoxic 4.5 h, settle 1 h, and idle 1 h) and employing a PVC tube as a carrier medium for the simultaneous carbon, nitrogen, and phosphorus removal from synthetic wastewater is discussed. The EFBBR was operated and the system commissioning and optimization lasted for about 300 d. During the operation, the EFBBR was able to achieve chemical oxygen demand (COD), ammonia nitrogen (NH\textsubscript{4}-N), and phosphorus removal efficiencies of 90, 95, and 100\%, respectively. The results presented that C/N was insignificant for COD removal. At C/P = 33.2, there were productions including NO\textsubscript{2}-N and NO\textsubscript{3}-N. However, at C/P = 10.4, nitrification was restrained with TKN/COD from 0.0805 to 0.139, and phosphorus was eliminated completely. The reactor operation can achieve nitrite accumulation successfully. Therefore, the EFBBR is a novel high-powered equipment for carbon and phosphorus removal simultaneously with a shortcut nitrification–denitrification process.

Keywords: Extra-loop fluidized bed bioreactor (EFBBR); SBR; Shortcut nitrification–denitrification process; Phosphorus removal

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