Impacts of poly-aluminum chloride addition on activated sludge and the treatment efficiency of SBR

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ABSTRACT

Coagulants addition to a bioreactor is a widely used technology for improving phosphorus removal. As a common and low-cost coagulant, poly-aluminum chloride (PAC) may be widely used for wastewater treatment. In this article, the impacts of PAC on activated sludge and the treatment efficiency of sequencing batch reactor were investigated over 100 d for domestic wastewater treatment. Parameters of chemical oxygen demand (COD), nitrogen, phosphorus, MLSS, oxygen uptake rate (OUR), and dehydrogenase activity (DHA) were used to assess the activated sludge performance. The addition of 40 mg PAC/L (R2) enhanced phosphorus removal from 73.3% in control with zero PAC (R1) to 92.4% due to simultaneous chemical precipitation. PAC addition improved COD removal slightly and did not affect the removal efficiency of nitrogen. The average removal efficiency of COD of the reactor increased slightly from 86.2 to 89.6% by PAC addition. In R1, TN removal was in the range from 86.3 to 90.8%. Nitrogen removal efficiency remained unaffected (slightly dropped) during simultaneous precipitation in R2 and was in the range from 84.5 to 86.8%. The average inhibition rate of DHA and OUR was 32.1 and 55.3%, respectively. PAC addition gave proof to the increase of MLSS by some 40%. Results obtained from the present work confirmed that PAC addition, despite the toxicity and inhibition on micro-organisms, favored phosphorus removal in wastewater treatment.

Keywords: Wastewater treatment; Poly-aluminum chloride; Phosphorus removal; Oxygen uptake rate; Dehydrogenase activity

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