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Development of anammox process for removal of nitrogen from wastewater in a novel self-sustainable biofilm reactor

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Abstract

Effluent of an upflow anaerobic sludge blanket reactor was treated in a downflow rope-bed-biofilm-reactor (RBBR) to remove residual organic matter and nitrogen. Nitrogen removal was observed in phase 1 and phase 2 with and without aeration, respectively for 320 days each. Organic matter, ammonia and total nitrogen removal efficiencies of $78 \pm 2\%$, $95 \pm 1\%$ and $79 \pm 11\%$ were obtained in phase 1 and $78 \pm 2\%$, $93 \pm 9\%$ and $87 \pm 6\%$ in phase 2, respectively. In phase 2, anammox bacteria had a specific anammox activity of $3.35 \text{ g N m}^{-2} \text{ day}^{-1}$. Heme c concentration, sludge characteristics and reaction ratios of dissolved oxygen, alkalinity and pH corroborated contribution of anammox process. Using experimental results kinetic coefficients required for design of RBBR were estimated. Anammox gave more stable performance under varying nitrogen loading and this option is more sustainable for solving problem of nitrogen removal from sewage.

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