N removal pathways of Aerobic Granular Biomass

SARVAJITH. M,[1,2] AND Y. V. NANCHARIAH[1,2*]

[1]Water and Steam Chemistry Division, Bhabha Atomic Research Centre, kalpakkam- 603 102, Tamil Nadu, India
[2]Homi Bhabha National Institute, Anushaktinagar, Mumbai-400094, Maharastra, India
(e- mail: sarvajith@igcar.gov.in, * yvn@igcar.gov.in)

Strategy

Ammonium removal capability and N removal pathways of aerobic granular sludge was investigated. An operational strategy comprising of alternating anaerobic-aeration phases established microbial community capable of simultaneous removal of up to 800 mg/l NH^{4+}-N, 200 mg/l NO_3^--N, and 10 mg/l PO_4^{3-}-P.

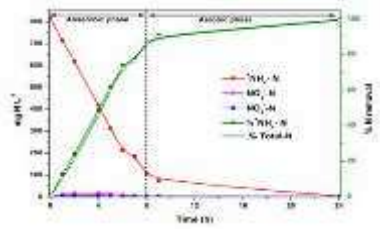

Figure 1: Profiles of N compounds during single cycle

Time Day	N Removal %		TN removal (%)
	Anaerobic	Aerobic	
100	88.9 ± 3.8	11.0 ± 4.2	97.5 ± 0.9
300	87.1 ± 2.0	11.5 ± 2.3	99.6 ± 0.4
600	88.1 ± 1.5	10.2 ± 1.6	99.8 ± 0.3
800	85.6 ± 2.6	15.1 ± 2.1	98.2 ± 0.6

Table 1: N removal during reactor operation

Discussion of results

Granular sludge was stable and functionally active under alternating anaerobic-aeration conditions and high ammonium loadings. NH_4^+-N removal was efficient, sustainable and associated with only subtle amounts of either nitrate or nitrite (Fig. 1). Interestingly, about 85-89% of the nitrogen was removed during anaerobic phase (Table 1). The operational strategy enriched the granular sludge with ammonia oxidizing bacteria, denitrifying bacteria but not nitrite oxidizing bacteria. Results supported occurrence of anammox-denitrification and nitritation-denitrification pathways.

[1] Nancharaiah *et al.* (2016) *Bioresour. Technol.* **215**,173-185.[2] Bunce *et al*.(2018) Front. Environ. Sci. **6,** 8