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Denitrification of high sodium nitrate bearing effluents using flow-through bioreactor

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ABSTRACT

Denitrification of sodium nitrate solution has been studied by isolating biomass, identification of suitable growth medium and finally its use in batch bioreactor. The progress of denitrification of 730 mg/l nitrate as $NaNO_3$ solution has been evaluated for 10 consecutive cycles. The use of harvested cells with gradual increase of nitrate concentration in the batch bioreactor resulted in better acclimatized biomass. Complete denitrification of different concentrations of $NaNO_3$ solution up to 8800 mg/l NO_3^- was reached in batch studies. A flow through bioreactor was assembled by growing biomass on to interstices of stainless steel modules and this system was used to study the effects of process variables like C/N ratio, addition of trace elements, etc., on denitrification of high nitrate laden solutions. Based on the gradual acclimatization of biomass to high nitrate bearing solutions, complete denitrification of 12,400 mg/l of nitrate was achieved. Successful demonstration of the process by continuous operation of the column over a period of six months shows the viability of the process in practical application, for denitrification of effluents generated during back end of the nuclear fuel cycle.

Keywords: Biodenitrification; Pseudomonas; Radioactive effluent; Nitrate; Bioreactor; Sodium nitrate; Biomass

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