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# Effect of Free Cells and Additional Supporting Material on Performance of Polyethylene Glycol (PEG)-Pellet Reactor to Treat NH4-N Contaminated Groundwater

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## ABSTRACT

To study the effect of free cells (suspended bacteria) on performance of entrapped bacteria system (i.e. polyethylene glycol (PEG)-pellet reactor) to treat NH4-N contaminated groundwater, two PEG-pellet reactors with a lot of free cells - Reactor A containing PEG-pellet and Reactor B containing PEG-pellet and supporting material - and the another control reactor without free cells (Reactor C) were set-up. Three reactors were operated under various NH4-N concentrations (40-60 mg/L) and various temperatures (5-25°C). The results show that the free cells effected on the NH4-N removal efficiency significantly. The free cells developed to be a biofilm layer on the pellet surface for Reactor A, the biofilm layer caused the decreasing NH4-N diffusion and incomplete nitrification eventually. On the other hand, most free cells attached to the supporting material for Reactor B. Although the NH4-N could diffuse properly, the free cells consuming acetate caused the added acetate was insufficient for complete denitrification. However, the results suggest that the supporting material could reduce the effect of free cells on the reactor performance at low temperature as indicated by 1) higher efficiency and 2) lower activation energy (Ea) for nitrification and denitrification in Reactor B than Reactor A.

## KEYWORDS

NH4-N removal, Nitrification and Denitrification, Groundwater Purification, Polyethylene Glycol (PEG)-Pellet, Supporting Material, Free Cells

## Cite this paper

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