

## Simultaneous fluoride and nitrate removal from drinking water using mixotrophic denitrification processes in a fixed bed column reactor

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## ABSTRACT

Nitrate and fluoride are water contaminants found together in some regions where agricultural activities are widespread. The concentration of these contaminants is important since nitrate causes methemoglobinemia in infants and fluride causes dental diseases. In this study, a fixed bed column reactor was used with sulfur and limestone media to remove these contaminants under simultaneously autotrophic and heterotrophic (mixotrophic) conditions at 30°C. The reactor was operated under these conditions for 125 d and 49.7 mg/L of NO<sub>3</sub>-N and 5.3 ± 0.4 mg/L of F<sup>-</sup> were removed at 95.0 and 90.0% efficiency, respectively. Effluent pH was 7.8 and alkalinity was not exceeded 200 mg/L. Removal mechanisms of nitrate and fluoride were biological denitrification and physicochemical (adsorption and precipitation), respectively, since batch experiments agreed that the removal mechanism of fluoride was not biological. This study showed that both NO<sub>3</sub><sup>-</sup> and F<sup>-</sup> can be removed in one reactor under mixotrophic conditions, simultaneously.

Keywords: Nitrate; Fluoride; Removal; Mixotrophic; Denitrification; Fixed bed column reactor

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