

DENITRIFICATION OF ION-EXCHANGE BRINES USING LENTIKATS BIOTECHNOLOGY

DENITRIFIKACE ZASOLENÝCH VOD PO REGENERACI IONTOMĚNIČOVÝCH KOLON
POMOCÍ BIOTECHNOLOGIE LENTIKATS

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Abstract:

Paracoccus denitrificans encapsulated in polyvinyl alcohol matrix (Lentikats Biocatalyst, LB) was applied for elimination of high nitrate concentrations (up to $2.26 \text{ g}\cdot\text{L}^{-1} \text{ N-NO}_3^-$) from ion-exchange regeneration brines ($12.14 \text{ g}\cdot\text{L}^{-1} \text{ Cl}^-$, $1.35 \text{ g}\cdot\text{L}^{-1} \text{ SO}_4^{2-}$). The elimination of nitrates followed zero-order kinetics, while the concentration of nitrite-intermediates exhibited a peaking course. The maximum obtained activity of 1 kg of Lentikats Biocatalyst was $>1000 \text{ mg}$ of N-NO_3^- removed per hour and the nitrates removal efficiency exceeded 99 %. Correlation analysis of results from preliminary batch experiments revealed that the main factors affecting denitrification activity were temperature and time elapsed from the last Biocatalyst's cultivation, while the effect of salinity was statistically insignificant. A decrease of Biocatalyst's activity during the course of repetitive experiments was caused by a lack of nutrients in the brines, disabling any proliferation of encapsulated microorganisms. Integration of nutrient-supplementing cultivation steps into the treatment process enabled restoration of the initial denitrification activity and repetitive long-term applicability of the Biocatalyst. Initial batch results were further confirmed in a four-month continuous operation. The results show that *P. denitrificans* encapsulated in Lentikats Biocatalyst is applicable for the removal of high concentrations of nitrates from similar types of ion-exchange brines.

Keywords:

Lentikats Biotechnology; Polyvinylalcohol; Denitrification; Ion-exchange brines regeneration; High-salinity waters; *Paracoccus denitrificans*