Removal of nitrogen from simulated ground water by scoria: dynamic processes and modeling

Tianzi Dong\textsuperscript{a,b,c}, Yuling Zhang\textsuperscript{a,b,c,*}, Xiaosi Su\textsuperscript{b,c}, Rui Li\textsuperscript{a,b,c}

\textsuperscript{a}College of Environment and Resources, Jilin University, Changchun 130021, China
\textsuperscript{b}Key Laboratory of Groundwater Resources and Environment, Ministry of Education, Jilin University, Changchun 130021, China
\textsuperscript{c}Institute of Water Resources and Environment, Jilin University, Changchun 130021, China, Tel. +8613756160831, email: lingling29@126.com (Y. Zhang)

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\textbf{A B S T R A C T}

In this study, the dynamic processes of nitrogen removal from aqueous solutions were identified. The study used column experiments at different influent flow rates (40 mL/min, 60 mL/min and 80 mL/min) and different nitrogen concentrations (1 mg/L, 2 mg/L, and 5 mg/L for NH\textsubscript{4}\textsuperscript{+}-N and NO\textsubscript{2}\textsuperscript{-}-N; 30 mg/L, 50 mg/L, and 80 mg/L for NO\textsubscript{3}\textsuperscript{-}-N). The adsorption data for nitrogen fitted well with the Thomas and Yoon-Nelson models. At different filled heights (0.5 m, 0.75 m, and 1.0 m), the adsorption data fitted well with the Bed Depth Service Time model. The back-flush method can enable scoria to recover purification efficiency. After seven back flushes, the regeneration rate was better than 90%. Breakthrough curves from tank experiments yielded very similar results to the column experiments. The breakthrough time of NH\textsubscript{4}\textsuperscript{+}-N and NO\textsubscript{2}\textsuperscript{-}-N in the tank experiments were almost the same as in the column experiments. However, the breakthrough time of NO\textsubscript{3}\textsuperscript{-}-N was slightly shorter than in column experiments.

Keywords: Scoria; Nitrogen adsorption; Dynamic processes; Modeling; Back flush