Biological denitrification in simulated groundwater using polybutylene succinate or polylactic acid-based composites as carbon source

Rui Zhang\textsuperscript{a}, Yihe Zhang\textsuperscript{a,}\textsuperscript{*}, Fengzhu Lv\textsuperscript{a}, Heli Wang\textsuperscript{b,}\textsuperscript{*}, Shuchen Tu\textsuperscript{a}

\textsuperscript{a}Beijing Key Laboratory of Materials Utilization of Nonmetallic Minerals and Solid Wastes, National Laboratory of Mineral Materials, School of Materials Science and Technology, China University of Geosciences, Beijing 100083, China, Tel./Fax: +86 10 82323433; emails: zhangrui0432@gmail.com (R. Zhang), zyh@cugb.edu.cn (Y. Zhang), lfz619@cugb.edu.cn (F. Lv), tushuchen2013@126.com (S. Tu)

\textsuperscript{b}School of Water Resources and Environment, China University of Geosciences, Beijing 100083, China, email: wangheli@cugb.edu.cn

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ABSTRACT

Two novel multiple component carbon sources, mainly polybutylene succinate (PBS) and polylactic acid, were prepared by twin-screw extrusion to treat simulated groundwater. Both of the composites also contained high-density polyethylene and walnut shell (WS) to adjust the denitrification rate. The composites could release soluble organic carbon and be carriers for bacteria. The addition of foaming agent in the composite enriched the porous channels which increased the surface area for biofilm loading. The results indicated that the average N-NO\textsubscript{3}/C\textsubscript{0} removal efficiency in reactor 1 (filled with WS/PBS) was 83%. When the inflow concentration of nitrate changed from 50 to 55 mg L\textsuperscript{-1}, the reactor 1 had an acclimation time of 13 d to accept the high concentration. However, the N-NO\textsubscript{3} removal efficiency in reactor 2 (filled with WS/PLA) decreased from 86 to 78% because of the propagation of blue-green algae which also led to a high COD value in effluent. WS/PBS was a stable carbon source releaser and could adapt to the environmental change easily. Therefore, it has the potential of using as carbon source of biological denitrification of groundwater.

Keywords: Denitrification; N-NO\textsubscript{3} removal; Biodegradable polymer; Solid carbon source