Enhanced Nitrogen Removal Performance of Nitrogen-Containing Domestic Wastewater Using Tourmaline/Biochar Synergistically Modified Fillers

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Abstract

The prior art often has the problem of poor nitrogen removal effect when treating domestic sewage. Based on this, a kind of tourmaline/biochar modified fillers were prepared in this study. By putting the fillers into the fixed-bed biofilm reactor and comparing with the fillers modified by high-density polyethylene (HDPE) and biochar, the effect of enhanced denitrification was explored, the removal mechanism was analyzed by surface roughness, Zeta potential and high-throughput sequencing.The results showed that in the simulated domestic sewage with C/N = 3 and HRT = 8, the removal rate of NO_3 -N can be significantly improved by tourmaline/biochar synergistic modification fillers, which is 27% higher than that of HDPE fillers, and 21% higher than that of biochar fillers. On the one hand, the tourmaline in the modified fillers improved the electron transfer efficiency through the piezoelectric effect. On the other hand, the higher surface roughness and bioelectrophilicity of the fillers are conducive to the attachment and proliferation of microorganisms, especially denitrifiers Kinetobacter and unclassified Comamonadaceae. The research shows that the modified filler of tourmaline/biochar has great potential for nitrogen removal, which can provide theoretical basis and technical support for the engineering application of low carbon ratio nitrogen removal technology for nitrogen-containing domestic sewage.

Keywords

Tourmaline/Biochar-modified Fillers, Diomembrane Technology, Domestic Wastewater, Enhanced Denitrification, Microbial Community Structure Differences