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Influence of electric field and iron on the denitrification process from nitrogen-rich wastewater in a periodic reversal bio-electrocoagulation system

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Abstract

This study proposed a periodic reversal bio-electrocoagulation system (PRBES) with Fe-C electrodes and three other control systems and explored their denitrification mechanism. The experimental results illustrated that iron ions contributed to increasing biomass and denitrifying bacteria and that the electric field may enhance the nitrogen transfer rate and enzyme activities. The dominant bacterial genera in the four systems were the *Enterobacter* (32.75%), *Thauera* (9.29%), *Paracoccus* (8.54%), *Hyphomicrobium* (5.01%) and *Saccharibacteria_genera* (10.57%). The sum of the relative abundance of the first four bacteria, which were the major microorganisms in the denitrification process in this study, was 64.61%, 55.40%, 61.19% and 47.08%, respectively, in PRBES and the three other control systems at 10 ºC. Additionally, compared to the conventional SBR, there was a 65.48% decrease in N_2O in PRBES at 10 ºC. This study provided a meaningful and significant understanding of denitrification in PRBES when treating nitrogen-rich wastewater.

Keyword: periodic reversal bio-electrocoagulation system; enzyme activity; microbial communities; denitrification rate; low C/N wastewater

1 Introduction

Aqueous nitrogen pollution has become a serious global environmental problem, resulting in water eutrophication and potential hazards to human health (Deng et al., 2016a). It was reported that the hazard of