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Enhanced NH_4^+–N removal in a bioelectrochemical system with fabricated activated carbon-polytetrafluoroethylene electrodes

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ABSTRACT

Activated carbon (AC) is a promising electrode material for a bioelectrochemical system (BES) because of its high performance and low cost. Here, AC was flat-pressed with carbon black and polytetrafluoroethylene to fabricate the electrodes. These AC-based electrodes were applied in a single-chamber BES to achieve autotrophic NH_4^+–N removal under organic carbon-free conditions. In batch experiments, NH_4^+–N removal could be enhanced by applying voltage to the BES, in which case the NH_4^+–N removal efficiency gradually increased as the applied voltage increased from 0.1 to 0.25 V. The average NH_4^+–N removal rate in a BES was 47.8 mg L^{-1} d^{-1} in this study, which was comparable with the results of previous studies under similar conditions. Cyclic voltammetry results revealed the presence of several redox-active components on the anode and cathode surfaces, indicating that the AC-based bioanode and biocathode had good electroactivities. Microbial community analysis of 16S rRNA genes based on high-throughput sequencing indicated that the diversity of the microbial community increased after electric power application and that *Pseudomonas* and *Paracoccus* could be important for nitrogen-compound removal in the BES.

Keywords: Activated carbon; Biofilm; Ammonia removal; Bioelectrochemical system (BES)

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