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Enhanced power generation and wastewater treatment in sustainable biochar electrodes based bioelectrochemical system

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Abstract

Corn-straw biochar (BC500 and BC900) and KOH modified biochar (BAC) were used as the electrode materials of bioelectrochemical system (BES). Compared to carbon felt (CF) electrodes BES, the maximum power density of BC500, BC900 and BAC anodes BES increased by 10.7%, 56.0% and 92.0%, and that of BC500, BC900 and BAC cathodes BES increased by 3.1, 5.2 and 4.8 times, respectively. The CF electrodes BES was optimized to decolor the AO7 simulated wastewater and 97% of AO7 was quickly degraded within 2 hours. When using biochar anodes, the decoloration rates were enhanced. The apparent rate constant (k_{app}) increased from 2.93 h^{-1} for CF anode BES to 3.58, 4.35 and 5.33 h^{-1} for BC500, BC900 and BAC anode system, respectively. AO7 could also be effectively decolored in biochar cathode systems, which was mainly due to adsorption.

Key words: Biochar; Bioelectrochemical system; Power performance; Decoloration; Azo dyes