Title:	Aerobic microbial electrochemical technology based on the coexistence and interactions of aerobes and exoelectrogens for synergistic pollutant removal from wastewater†
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Abstract:	Microbial electrochemical technologies (METs), like microbial fuel cells, usually involve an anoxic bioanode. These technologies face considerable challenges during practical wastewater treatment due to the relatively low performance in terms of COD and pollutant removal as well as power output. In this study, we present a new concept of aerobic microbial electrochemical technology (A-MET) based on the coexistence and synergistic interactions of exoelectrogens and aerobes under aerobic conditions. It was realized by using the aerobic rotating electrode bioreactor (AREBR) concept to include/integrate microbial electrochemical reactions into the traditional rotating biological contractor (RBC) technology. Electrically conductive materials with electrocatalytic activity for oxygen reduction reaction (ORR) served as biofilm supports in the AREBRs instead of the non-conductive materials (e.g., polymer) in the traditional RBC. The AREBR exhibited multifunctional behavior that included aerobic and electrode-dependent respiration for organic carbon oxidation, electrode-dependent denitrification and ORR. Microbial community analysis revealed the dominance of the genus Neomegalonema as a potential biofilm producer and of the genus Arcobacter as an exoelectrogen within the biofilms of the AREBRs. The Neomegalonema spp. biofilm may have served as a protective layer and blocked the diffusion of oxygen by aerobic respiration of i.e. acetate. In situ ORR activity most likely consumed the electrons and sustained the respiration of Arcobacter. Higher ORR electrocatalytic activity of the biofilm support was found to be associated with the enhanced growth of Arcobacter in the AREBR. Thus, the A-MET concept allowed combining the merits of both aerobes and exoelectrogens at the same solid–liquid interface under aerobic conditions for efficient and synergistic pollutants removal from wastewater.
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