Polyethylene microplastics influence microbial electrogenesis process and biofilm viability in microbial electrochemical systems

Wang, Song; Xu, Mingyi; Zhang, Yifeng

Publication date:
2021

Document Version
Peer reviewed version

Polyethylene microplastics influence microbial electrogenesis process and biofilm viability in microbial electrochemical systems

Song Wang, Mingyi Xu, Yifeng Zhang
Department of Environmental Engineering, Technical University of Denmark, DK-2800 Lyngby, Denmark

The ubiquitous microplastics have already been considered as emerged threats. Their impacts on natural and environmental processes, especially microbial activities, have aroused widespread attention. In this study, we investigated how polyethylene microplastics (PE-MP) influence the anodic microbial electrogenesis performance in both microbial fuel cells (MFCs) and microbial electrolysis cells (MECs). When the concentration of PE-MP involved in the anode chamber increased from 0 to 75 mg/L, a clear decline in the current output was noticed in the MECs, together with a decreasing abundance of electroactive bacteria (EAB). While in the MFCs, the electrogenesis performance was not significantly influenced by the PE-MP addition. The EAB abundance in MFCs even slightly increased with 25 mg/L PE-MP and afterward decreased with 75 mg/L. Besides, the general microbial community richness and the MP-related OTUs were decreased as well. The quantitative PCR results of electron transfer related genes (pilA and mtrC) and cytochrome c concentration confirmed the suppression of PE-MP on extracellular electron transfer. This study provides the first glimpse into the influence of PE-MP on the microbial electrogenesis process and direct evidence at the gene level, which may offer insights into the practical application of microbial electrochemical systems for microplastics-containing wastewater treatment.