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Abstract: The performance of a microbial fuel cell (MFC) to degrade oxyfluorfen was investigated. Approximately 77% of 50 mg/L oxyfluorfen was degraded within 24 h by anodic biofilm. The temperature, pH, and initial oxyfluorfen concentration had a significant effect on oxyfluorfen degrading, and a maximum degradation rate of 94.95% could theoretically be achieved at 31.96 ℃, a pH of 7.65, and an initial oxyfluorfen concentration of 120.05 mg/L. Oxyfluorfen was further catabolized through various microbial metabolism pathways. Moreover, the anodic biofilm exhibited multiple catabolic capacities to 4-nitrophenol, chloramphenicol, pyraclostrobin, and sulfamethoxazole. Microbial community analysis indicated that functional bacteria *Arcobacter*, *Acinetobacter*, *Azospirillum, Azonexus*, and *Comamonas* were the predominant genera in the anodic biofilm. In terms of the efficient removal of various organic compounds and energy recovery, the MFC seemed to be a promising approach for the treatment of environmental contaminants.