Highly sensitive analysis of marine corrosion microbial genomes and intelligent early warning technology

Yan Zeng[1], Yanan Zhou[1,2], Peng Wang[1], Dun Zhang[1]

[1] Key Laboratory of Advanced Marine Materials, Key Laboratory of Marine Environmental Corrosion and Bio-fouling, Institute of Oceanology, Chinese Academy of Sciences, Qingdao, 266071, China

[2] Chinese Academy of Science, Beijing 100049, China

Presenter's e-mail address: zengyan@qdio.ac.cn

Abstract Sulfate-reducing bacteria (SRB) are the most corrosive and widely studied corrosion microorganisms, which are widely present in marine environments. The functions and behaviors of corrosion microorganisms depend on their complex gene networks. It is very important to study their intracellular functional expression genes to manipulate the behavior phenotype of microbial corrosion.

This study constructed a high-voltage output device (DEG) based on the droplet triboelectric effect.[1] By constructing a polydimethylsiloxane-doped high-entropy oxide material as the middle layer of DEG, the high entropy effect and strong charge capture ability of the middle layer material are used to effectively reduce the charge decay, thereby providing a guarantee for increasing the voltage output of DEG, and successfully achieving a high voltage output of 420 V and a current output of 0.23 mA. Subsequently, the study constructed a highly sensitive detection and analysis method and early warning system for SRB gene fragments based on DEG, which provides new possibilities for the analysis of low-capacity and high-sensitivity corrosion microbial genome samples.

This study is a new research exploration in the field of marine environmental corrosion, which has important scientific value for the quantitative detection and analysis of the functional gene information of corrosion microorganisms and the exploration of early warning of microbial corrosion from the functional genetics level.

Keywords Microbiological Corrosion, sulfate reducing bacteria, genomes analysis

Reference

[1] Yanan Zhou, Yan Zeng, Jianming Wang, et al，Enhancement of the voltage output of droplet electricity generators using high dielectric high-entropy oxide composites，Energy &Environmental Science, 2024, 17, 3580.