Corrosion behavior of the chitosan'zinc composite films in sulfate-reducing bacteria

Xiaofan Zhai, Ke Li, Fang Guan, Congtao Sun, Jizhou Duan, Baorong Hou

PII: S0257-8972(18)30289-5
DOI: doi:10.1016/j.surfcoat.2018.03.032
Reference: SCT 23212

To appear in: *Surface & Coatings Technology*

Received date: 17 November 2017
Revised date: 27 February 2018
Accepted date: 13 March 2018

Please cite this article as: Xiaofan Zhai, Ke Li, Fang Guan, Congtao Sun, Jizhou Duan, Baorong Hou , Corrosion behavior of the chitosan'zinc composite films in sulfate-reducing bacteria. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Sct(2017), doi:10.1016/j.surfcoat.2018.03.032

Corrosion behavior of the chitosan-zinc composite films in sulfate-reducing bacteria

Xiaofan Zhai [a, b *], Ke Li [a,b,c], Fang Guan [a,b], Congtao Sun [a,b], Jizhou Duan [a, b *], Baorong Hou [a,b]

[a] Key Laboratory of Marine Environmental Corrosion and Bio-fouling, Institute of Oceanology, Chinese Academy of Sciences, No.7 Nanhai Road, Qingdao 266071, China

[b] Open studio for marine Corrosion and Protection, Qingdao National Laboratory for Marine Science and Technology, No.1 Wenhai Road, Qingdao 266235, China

[c] University of Chinese Academy of Sciences, 19 (Jia) Yuquan Road, Beijing 100049, China

Abstract

Sulfate-reducing bacteria (SRB) is one of the chief inducers of microbiologically influenced corrosion in marine environment. In our previous work, a novel chitosan-zinc film was electrodeposited and found to be effectively antibacterial, so research on the corrosion behavior of chitosan-zinc films in SRB medium is highly significant for estimating the films to be applied in real-sea environment. In this paper, detection of SRB metabolism, electrochemical methods and surface analyses were performed to clarify the corrosion behavior. During 6 d exposure in SRB, obvious inhibition on SRB growth and metabolism were found by monitoring the environment corrosive factors. By calculating the corrosion rate and analyzing surface morphologies, chitosan-zinc films showed relatively high corrosion resistance. After exposure, biofilm together with corrosion products formed on zinc film, while corrosion product layer with little bacteria attached on chitosan-zinc composite film. Further electrochemical results showed that the addition of chitosan did not change the anodic and cathodic behavior of the films, but enhanced the corrosion resistance by reducing the corrosive ability SRB medium, inhibiting bacteria attachment and raising the films' electric conductibility to a certain extent.