Enhancing the Photocatalytic Activity of TiO₂ by Modifying Surface with Polar Organic Anions for photocathodic Protection of 304 Stainless Steel

Zheng Ma^{1,2,3,5}, Xuehui Liu^{1,4}, Xiumin Ma^{2,3,5*}, Lifei Wang^{3,4,5}, Baorong Hou^{1, 2,3,5*}

¹ Institute of Marine Science and Technology, Shandong University, No. 72 Binhai Road, Qingdao, 266237, P. R. China.

² Open Studio for Marine Corrosion and Protection, Pilot National Laboratory for Marine Science and Technology, No. 1 Wenhai Road, Qingdao, 266200, P. R. China.

³ Institute of Oceanology, Chinese Academy of Sciences, No. 7 Nanhai Road, Qingdao, 266071, P. R. China.

⁴ State Key Laboratory for Marine Corrosion and Protection, Luoyang Ship Material Institute, Qingdao, Shandong Province 266101, P.R. China

⁵ Center for Ocean Mega-Science, Chinese Academy of Sciences, 7 Nanhai Road, Qingdao, 266071, P. R. China.

*E-mail: houb@qdio.ac.cn

doi: 10.20964/2020.07.40

Received: 29 December 2019 / *Accepted:* 31 March 2020 / *Published:* 10 June 2020

In this study, TiO₂ nanotube arrays (TiO₂ NTAs) were successfully prepared using 4-nitrothiophenol complex on the surface of fabricated arrays via the two-step anodization of Ti substrate, followed by a hydrothermal method. The formation of Ti–S band on the surface of TiO₂ NTAs increased the light absorption property of TiO₂. The existence of benzene ring and nitro increased the efficiency of hole transfer and further promoted the separation efficiency of photoinduced carriers in TiO₂ NTAs. Under visible light irradiation, the composite film demonstrated an effective photocathodic protection of 304 stainless steel.

Keywords: Corrosion, Photocathodic protection, Visible light, 4-Nitrothiophenol, TiO₂.

[FULL TEXT](#)

© 2020 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).