Trivalent Chromium Based Conversion Coating Contains Zinc/ $\text{Zn}(\text{OH})_2$ on Iron Substrates for the Detection of Uric Acid in Biological Samples and Control of Dyeing

Yi-Huan Su¹, Fu-Cheng Chiang¹, Cheng-Chien Chang¹, Shun-Te Lin¹, Ching-Tai Chen¹,
Tse-Wei Chen^{2,3}, Shen-Ming Chen^{2,*}

¹ Technical Service For Anodized Aluminum, Everlight Chemical Industrial Corporation Plant 1, No.271, ZhongShan N. Rd., Dayuan Industrial Park, TaoYuan Country 337, Taiwan.

² Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, No. 1, Chung-Hsiao East Road, Section 3, Taipei 10608, Taiwan, ROC.

³ Research and Development Center for Smart Textile Technology, National Taipei University of Technology, No.1, Section 3, Chung-Hsiao East Road, Taipei 106, Taiwan.

*E-mail: smchen78@ms15.hinet.net

doi: 10.20964/2020.05.01

Received: 5 December 2019 / Accepted: 13 February 2020 / Published: 10 April 2020

Over the past decades, the researchers are using the hexavalent chromium passivation for improving the corrosion resistance of sacrificial zinc and zinc alloy electrochemical coatings on iron substrates. However, the chromium Cr (VI) is hazardous to the environment and researchers are urge to finding the replacements of the Cr (VI). Interestingly, the trivalent chrome passivation is one of the best alternative materials to date due to its unique nature such as ease of adaptability, safety and economic considerations. In this research, the factors that affect dyeing process in the trivalent chromium passivation were mainly discussed. The Zeta potential and Electrical conductivity introduced to scale the dyeing affinity. Also comparing ions between the passivation agents by IC and ICP-OES measurement to improving the intensity of coloring to achieve the optimization of the dyeing process parameters. In addition, in this work we prepared the zinc hydroxide $\text{Zn}(\text{OH})_2$ nanoparticles were employed to detect the uric acid (UA). Fascinatingly, the prepared sensor material shows a wider linear range of 0.02 to 154 μM with the detection limit of 0.204 μM and the sensor material shows the excellent found and recoveries in practical applicability of urine sample.

Keywords: trivalent chromium passivation film, dyeing, $\text{Zn}(\text{OH})_2$ NPs, uric acid, electrochemical sensor

[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/>).