A high-performance Ti-Zr Based Chromium-Free Conversion Coating on 2024 Aluminum Alloy

Q.P. Li^{1,2,*}, Z.Q. Yan^{2,3}, Q. Xu¹, B. Zhang², S. Sun³, J.G. Liu², C.W. Yan²

¹ School of Metallurgy, Northeastern University, Shenyang 110142

² Laboratory for Corrosion and Protection, Institute of Metal Research, Chinese Academy of Sciences, Shenyang 110016

³ School of Science, Shenyang University of Technology Shenyang 110870

*E-mail: qppli@imr.ac.cn

doi: 10.20964/2016.12.39

Received: 27 August 2016 / *Accepted:* 4 October 2016 / *Published:* 10 November 2016

In order to further improve the corrosion resistance of the chromium-free Ti-Zr conversion coating on 2024 aluminum alloy (AA2024), a novel Ti-Zr based conversion coating on AA2024 is successfully prepared by introducing the cathodic inhibitor of benzimidazole into the Ti-Zr conversion solution. After the conversion treatment, AA2024 substrate is well covered with the porous Ti-Zr conversion coating composed of the micron-sized particles. And the Ti-Zr conversion coating mainly consists of the metallic oxide (TiO₂, ZrO₂, Al₂O₃), metallic fluoride (ZrF₄ and AlF₃) and C-N complex. More important is that there are no apparent corrosion products or defects could be observed during the whole 168 h NSS test, indicating the significantly excellent corrosion resistance for AA2024 with Ti-Zr conversion coating compared with other chrome-free conversion coatings. The electrochemical measurements indicate the corrosion resistance of the Ti-Zr conversion coating is not so outstanding at the initial stage, what is worth cherishing is that its anti-corrosion property is gradually improving in the following period. Therefore, the Ti-Zr conversion coating with excellent corrosion resistance might be a promising high-performance protective coating for AA2024 compared with other chrome-free conversion coating.

Keywords: 2024 aluminum alloy; Benzimidazole; Ti-Zr conversion coating; Corrosion resistance

[FULL TEXT](#)

© 2016 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/>).