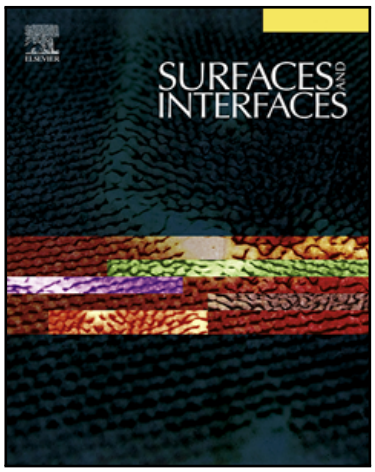

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Aluminum alloy AA2024 anodized from the mixed acid system with enhanced mechanical properties

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Abstract: Anodic oxidation technology is commonly used for surface enhancement for aluminum and its alloys. Aluminum alloy AA2024 was anodized from the mixed acid system with sulfuric and malonic acid. Effects of the anodized temperature on the microstructure, micro hardness, thickness, nanohardness, elastic modulus, wear resistance and corrosion resistance were investigated. The results showed the anodized temperature played an important role in the microstructure of anodized 2024 and resulted in the modulation of micromechanics and anticorrosion performances. When anodized temperature below 10℃, both periodical pores and arranged small units appeared at the surface, which was different from traditional anodic oxide films. Moreover, the anodized AA2024 possessed the optimum properties with hardness of 655.9Hv and thickness of 50μm, which cannot be obtained by the traditional anodized methods. Good wear resistance with the friction coefficient of 0.3240 and the lowest wear rate could be obtained. The pore structure was ruined as a result of temperature-enhanced dissolution. The diameter of the pores increased from 10nm to 23nm with the anodized temperature. It had also been found out that the lower anodized temperature could be favor for the anti-corrosion properties of anodized aluminum AA2024. Meanwhile, the results represented that the performance of the anodized aluminum AA2024 influenced by the anodized temperature were attributed to the pore structures on the surface.

Keywords: aluminum alloy AA2024; anodic oxide layer; wear resistance; nanoindentation; corrosion resistance

1. INTRODUCTION

In order to improve the hardness, wear resistance and anti-corrosion of aluminum alloys, surface treatment has become an indispensable key to expand the application