Accepted Manuscript

Comparison of tribological and corrosion behaviors of Cp Ti coated with the TiO_2/graphite coating and nitrided TiO_2/graphite coating

X.W. Tao, Z.J. Yao, X.X. Luo

PII: S0925-8388(17)31719-X

DOI: 10.1016/j.jallcom.2017.05.125

Reference: JALCOM 41855

To appear in: *Journal of Alloys and Compounds*

Received Date: 21 November 2016

Revised Date: 10 May 2017

Accepted Date: 12 May 2017

Please cite this article as: X.W. Tao, Z.J. Yao, X.X. Luo, Comparison of tribological and corrosion behaviors of Cp Ti coated with the TiO_2/graphite coating and nitrided TiO_2/graphite coating, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.05.125.

Comparison of tribological and corrosion behaviors of Cp Ti coated with the TiO_2/graphite coating and nitrided TiO_2/graphite coating

X.W. Tao, Z.J. Yao*, X.X. Luo

School of Materials Science and Technology, Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China

Corresponding author, Email: yaozj1921@126.com

Abstract:

The TiO_2/graphite coatings were fabricated by micro arc oxidation (MAO) process combined with or without plasma nitriding to improve the tribological and anti-corrosion performances of the Cp Ti. The microstructure and composition of the coatings were characterized by scanning electron microscopy (SEM), X-ray diffractometer (XRD), Raman spectroscopy and X-ray photoelectron spectroscopy (XPS), respectively. The tribological and corrosion behaviors were evaluated by the friction test and electrochemical test, respectively. Results show that the nitrided TiO_2/graphite coating exhibits relatively smooth surface with less porous structure. Its friction coefficient, wear rate under dry sliding condition and corrosion current density in artificial seawater are lower, compared to those of the TiO_2/graphite coating, indicating that it has perfect tribological property and corrosion resistance.

Keywords: Cp Ti; Micro arc oxidation; Plasma nitriding; Tribological behavior; Corrosion property

1. Introduction

Due to their low density, high specific strength and good corrosion resistance[1-3], titanium (Ti) and its alloys are promising materials for specific applications in marine engineering[3-5], such as propellers, oil-gas pipelines, etc. However, the native oxide layer (TiO_2) is too inferior to provide sufficient protection against wear and corrosion in the aggressive environments[6,7]. Numerous surface modification techniques have been employed to improve these poor properties of Ti and its alloy, including gas nitriding [8,9], physical vapor deposition (PVD) [10,11], ion implantation[12,13], micro arc oxidation (MAO) process [1,14-16], etc. Among these techniques, MAO process is an attractive one to endow Ti based materials with high hardness, good anti-corrosion property and excellent wear resistance[14,15].

Many works focusing on the tribological and corrosion behavior of MAO coating have been reported[16-21]. Wang et al[17] and Gu et al[18] investigated the effect of pretreatment on corrosion behavior of MAO coatings, respectively. They found that