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Comparison of tribological and corrosion behaviors of Cp Ti coated with the TiO₂/ graphite coating and nitrided TiO₂/graphite coating

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7 Abstract:

The TiO₂/graphite coatings were fabricated by micro arc oxidation (MAO) 8 process combined with or without plasma nitriding to improve the tribological and 9 anti-corrosion performances of the Cp Ti. The microstructure and composition of the 10 11 coatings were characterized by scanning electron microscopy (SEM), X-ray 12 diffractometer (XRD), Raman spectroscopy and X-ray photoelectron spectroscopy (XPS), respectively. The tribological and corrosion behaviors were evaluated by the 13 14 friction test and electrochemical test, respectively. Results show that the nitrided TiO₂/graphite coating exhibits relatively smooth surface with less porous structure. Its 15 friction coefficient, wear rate under dry sliding condition and corrosion current 16 density in artificial seawater are lower, compared to those of the TiO₂/graphite coating, 17 18 indicating that it has perfect tribological property and corrosion resistance.

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

21 **1. Introduction**

Due to their low density, high specific strength and good corrosion 22 resistance[1-3], titanium (Ti) and its alloys are promising materials for specific 23 applications in marine engineering[3-5], such as propellers, oil-gas pipelines, etc. 24 However, the native oxide layer (TiO_2) is too inferior to provide sufficient protection 25 26 against wear and corrosion in the aggressive environments[6,7]. Numerous surface modification techniques have been employed to improve these poor properties of Ti 27 and its alloy, including gas nitriding [8,9], physical vapor deposition (PVD) [10,11], 28 ion implantation[12,13], micro arc oxidation (MAO) process [1,14-16], etc. Among 29 30 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]. 31

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 Download English Version:

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