cbecimat26
26° Congresso Brasileiro de Engenharia e Ciência dos Materiais
22 a 26 de novembro de 2026
Costão do Santinho
Florianópolis-SC

Effect of Tio_2 Nanotube Growth on the Corrosion and Hydrogen Uptake Behavior of Ti Grade 23 and Ti Grade 29 Alloys

Hassan Asif [1]; Guilherme Yuuki Koga[1,2]; Arthur de Bribean Guerra[1,2]

1.Programa de Pós-Graduação em Ciência e Engenharia de Materiais (UFSCar); 2.Departamento de Engenharia de Materiais (UFSCar)

Email: hassanasif@estudante.ufscar.br

Introduction

- Ti Gr-23(ELI) and Ti Gr-29-0.1Ru is used because of their high tensile strength and good fatigue resistance in offshore oil and gas conditions.
- Both alloys were modified with TiO_2 nanotubes to observe their response towards corrosion resistance and hydrogen uptake.

Objectives

- Investigate the effect of anodically grown Tio_2 nanotube layers on the corrosion resistance of Ti-6Al-4V ELI (Grade 23) and (Grade 29) in chloride-containing (0.6 M L^{-1} NaCl)+acidic electrolyte (10% by volume H_2SO_4).

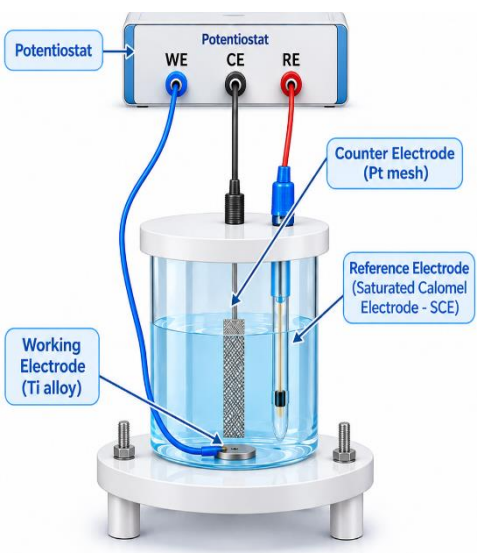
- Effect of anodically grown Tio_2 nanotube on hydrogen uptake and hydride formation under cathodic charging at −1800 mV (Ag/AgCl), simulating on-site cathodic protection conditions in saline (NaCl) electrolyte.

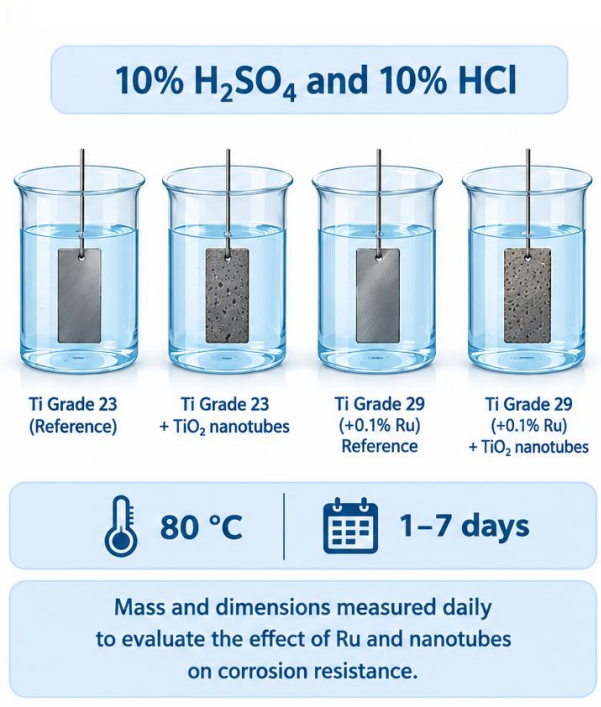
Methodology



Eletrochemical Corrosion analysis (OCP,CPP,EIS)

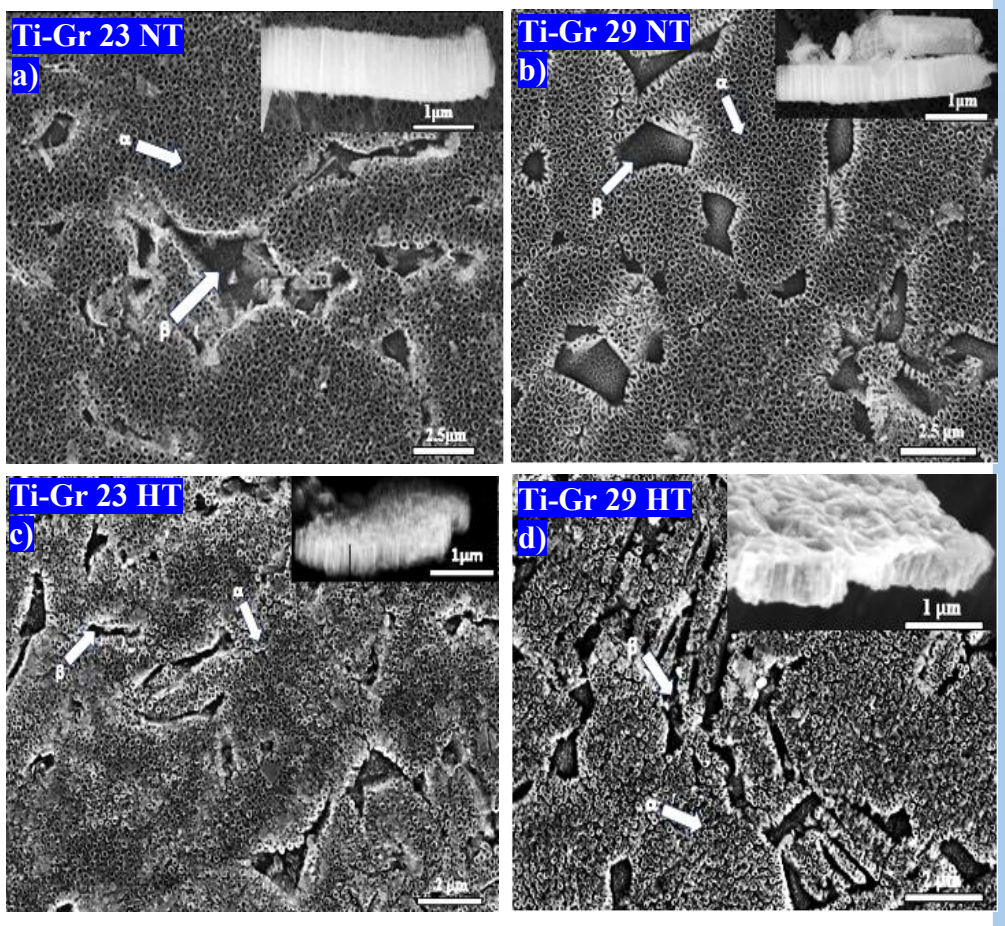
Immersion Corrosion to observe the effect of Ru Addition



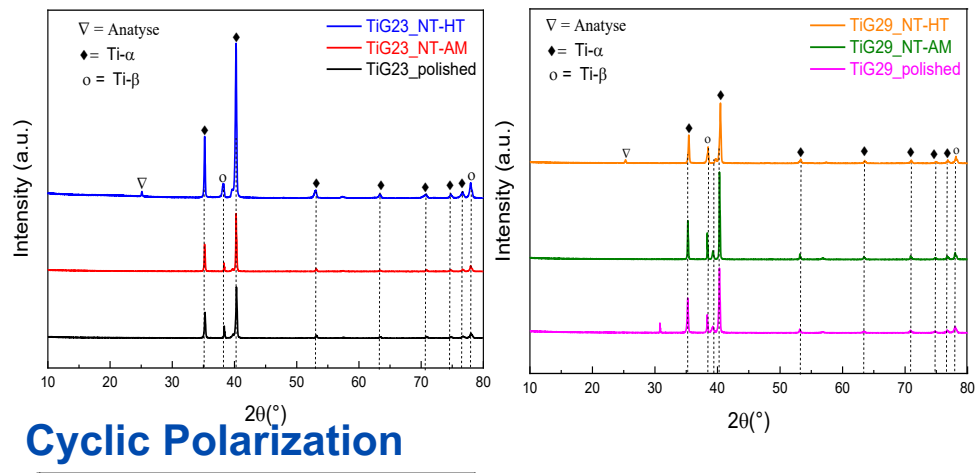


Results And Discussion

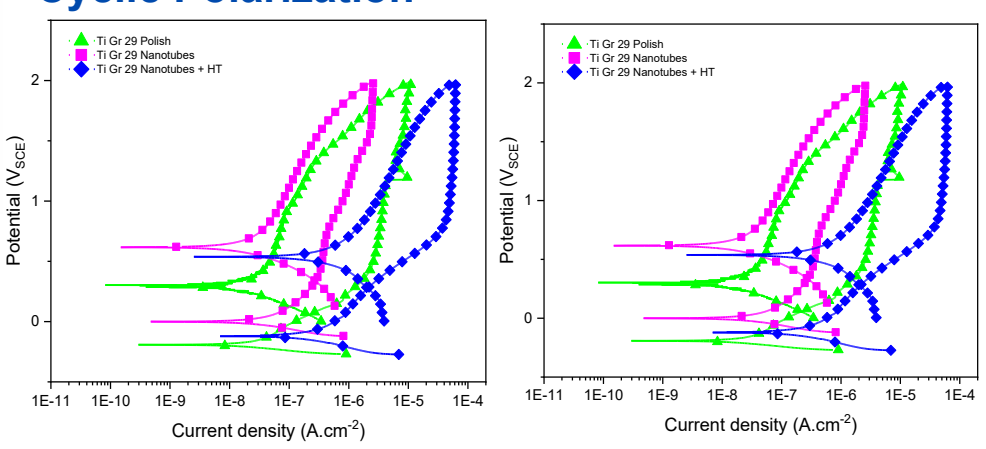
SEM Micrograpgh of Tio_2 Nanotubes



XRD



Cyclic Polarization



Conclusion:

- The Tio_2 nanotube layers did not improved corrosion resistance under investigated conditions with (0.6 M L^{-1} NaCl).
- Further investigations are ongoing using more acidic conditions (0.6 M L^{-1} NaCl) + acidic electrolyte (10% by volume H_2SO_4) to evaluate the corrosion behaviour and stability of nanotubes under more aggressive conditions.
- The role of Tio_2 nanotube layers as barrier to hydrogen absorption, requires further experimental investigation.

References and Acknowledgements

ufscar FAPESP CNPq ppgcem Programa de Pós-Graduação em Ciência e Engenharia de Materiais DEMa CCDM DEMa/UFSCar CAPES