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Effects of the substrate microstructure on the growth of TiO_2 nanotubes on Ti-35Nb-4Sn samples

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Ti and Ti alloys are widely used in the manufacturing of biomedical devices like orthopedic and dental implants because they present better biological and mechanical response than other metallic biomaterials. Reaction of Ti with oxygen leads to formation of a thin and dense oxide layer on sample surface. Under controlled conditions, this oxide layer may present a highly ordered porous structure, which can be applied in biomedical related devices, gas sensors, solar cells and hydrogen production. In Ti and Ti alloys, formation of nanotube oxide layers (ordered TiO_2) is able to increase corrosion resistance and biocompatibility. The aim of this work is to discuss the growth of highly ordered nanotubes of TiO_2 on Ti-35Nb-4Sn samples. Samples of Ti-35Nb-4Sn alloy were prepared by arc melting, solution heat treated at 1000 °C for 8 hour and cold deformed at 24%, 51% and 85%. TiO2 nanotubes growth was carried out in an electrochemical cell by using direct current at a constant voltage of 20 V in fluoridric acid electrolytes for 2 hours. TiO_2 nanotubes features were characterized by using optical microscopy (Olympus BX60M) and scanning electron microscopy (Zeiss - EVO/MA15). The results suggest that substrate microstructure affects directly the growth and orientation of the nanotubes.

Figure 1: Micrographs of TiO_2 nanotubes distribution and the respective microstructure of Ti-35Nb-4Sn samples deformed at: (a) 24%, (b) 51% and (c) 85%.

Keywords: Microstructure, Titanium alloys, TiO_2 nanotubes

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The effect of the fiber orientation of composites on free vibration analysis of aircraft structures

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The beam is the most model used in structural analysis. This model is effective for preliminary design of aerospace structures (Aeroelasticity, dynamic response, optimization, etc). New materials or composites have a high relationship between the bending and torsion modes due to their anisotropies. The purpose of this study is to show the influence of bending-torsion coupling K on modal analysis of aircraft structures by using FEM modeling. The bending-torsion coupling coefficient considered here is depended to the fiber orientation of laminated composite materials. The energy method is used to derive the basic mass and rigidity matrices of the beam where the stiffness matrix contains terms of bending-torsion coupling. An application for free vibration analysis of aircraft wing is validated in this study and it's generalized to aircraft structure model.

Biography

Bennamia Ismail is doing his Ph.D. at Institute of Aeronautics and Space Studies, Blida University. He obtained his Magister in aeronautics from Blida University in 2007.

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