World Academy of Science, Engineering and Technology
International Journal of Chemical and Materials Engineering
Vol:17, No:02, 2023

Corrosion Behavior of Different Electroplated Systems Coated With Physical Vapor Deposition

Authors : Jorge Santos, Ana V. Girão, F. J. Oliveira, Alexandre C. Bastos

Abstract : Protective or decorative coatings containing hexavalent chromium compounds are still used on metal and plastic parts. These hexavalent chromium compounds represent a risk to living beings and the environment, and, for this reason, there is a great need to investigate alternatives. Physical Vapor Deposition (PVD) is an environmentally friendly process that allows the deposition of wear and corrosion resistant thin films with excellent optical properties. However, PVD thin films are porous and if deposited onto low corrosion resistant substrates, lead to a degradation risk. The corrosion behavior of chromium-free electroplated coating systems finished with magnetron sputtered PVD thin films was investigated in this work. The electroplated systems consisted of distinct nickel layers deposited on top of a copper interlayer on acrylonitrile butadiene styrene (ABS) plates. Electrochemical and corrosion evaluation was conducted by electrochemical impedance spectroscopy and polarization curves on the different electroplated coating systems, with and without PVD thin film on top. The results show that the corrosion resistance is lower for the electroplated coating systems finished with PVD thin film for extended exposure periods when compared to those without the PVD overlay.

Keywords : PVD, electroplating, corrosion, thin film
Conference Title : ICEMC 2023 : International Conference on Electrochemical Methods in Corrosion
Conference Location : Paris, France
Conference Dates : February 06-07, 2023