A comparative study of the corrosion protective properties of Cr(VI) free conversion treatments

C.R. Tomachuk[1], A.R. Di Sarli[2], C.I. Elsner[2], I. Costa[1],
[1] Instituto de Pesquisas Energéticas e Nucleares, IPEN/CCTM, São Paulo, SP, Brasil, tomazuk@gmail.com
[2] Centro de Investigacíon y Desarollo en Tecnologia de Pinturas – CIDEPINT, La Plata, Argentina – direccion@cidepint.gov.ar

Abstract

The corrosion resistance of pure zinc coatings can be improved through the application of suitable chemical passivation treatments. Hexavalent chromium compounds have widely been used to formulate conversion layers providing better anticorrosive protection as well as anchorage properties to painting systems. However, taking into account that they are produced using hazardous chemical ingredients, the development of alternative and “green” technologies with equivalent protective performance is a paramount purpose of many R&D laboratories working around the world [1]. In this work, the corrosion behavior of zinc coatings obtained from free-cyanide alkaline baths and latterly subjected to a trivalent chromium based passivation treatment, with and without a sealing treatment, was studied. The experimental work involved electrochemical impedance spectroscopy measurements in sulfate solution, surface microstructural and morphological characterization by electronic microscopy as well as chemical analysis by EDXS. The analysis and interpretation of all the data coming from these batteries of tests allowed inferring that both the trivalent chromium based conversion treatment + adequate sealer provided a good corrosion resistance and, therefore, together with an adequate painting system, they could be a less polluting and less toxic alternative to the traditional chromate coatings.

Keywords: zinc, conversion treatment, corrosion, impedance spectroscopy

References

[1] Tomachuk, C.R.; Elsner, C.I.; Di Sarli, A.R.; Costa, I.
Corrosion resistance of Cr(III) conversion treatments applied on electrogalvanised steel and subject to chloride containing media
Materials Chemistry and Physics 119 (2010), pp. 19-29