

Corrosion Control of Carbon Steel Surface by Phosphonic Acid Nano-Layers

Authors : T. Abohalkuma, J. Telegdi

Abstract : Preparation, characterization, and application of self-assembled monolayers (SAM) formed by fluorophosphonic and undecenyl phosphonic acids on carbon steel surfaces as anticorrosive nanocoatings were demonstrated. The anticorrosive efficacy of these SAM layers was followed by atomic force microscopy, as the change in the surface morphology caused by layer deposition and corrosion processes was monitored. The corrosion process was determined by electrochemical potentiodynamic polarization, whereas the surface wettability of the carbon steel samples was tested with the use of static and dynamic contact angle measurements. Results showed that both chemicals produced good protection against corrosion as they performed as anodic inhibitors, especially with increasing the time of layer formation, which results in a more compact molecular film. According to the atomic force microscope (AFM) images, the fluoro-phosphonic acid self-assembled molecular layer can control the general as well as the pitting corrosion, but the SAM layers of the undecenyl-phosphonic acid cannot inhibit the pitting corrosion. The AFM and the contact angle measurements confirmed the results achieved by electrochemical measurements.

Keywords : nanolayers, corrosion, phosphonic acids, coatings

Conference Title : ICNST 2021 : International Conference on Nanomaterials Science and Technology

Conference Location : Istanbul, Türkiye

Conference Dates : December 20-21, 2021