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ZnO/TiO_2 MULTILAYERED NANOSTRUCTURES AS CORROSION PROTECTION COATINGS FOR METALS (SS 304)

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Abstract: Corrosion is a harmful phenomenon that affects metals and alloys in general. This inevitable problem causes the deterioration of a quarter of the world's production of metallic materials every year. Since several decades, scientists had focused their research on this problem in order to find impressive solutions to reduce the impact of this problem. They proposed more techniques to improve corrosion protection performance of these materials. Metal coatings, inhibitors and thin films and others were well developed in this case. Metal coatings were elaborated at high temperatures, which makes the process difficult to carry out and shows a great danger in the event of an accident. Inhibitors were used but their weaknesses, disadvantages are high cost, toxicities and cannot be used in opened environments, and their harmful effect on the environment has become undesirable. In last years, more studies were carried out on the deposition of nanostructured coatings by physical and chemical methods. The sol-gel method generate the interest of researchers around the world by its advantageous properties, as the low cost, easy to apply, will be done at room temperature and environment friendly.

The objective of this research work is the deposition of ZnO/TiO_2 nanostructure coatings on 304 stainless steel by the sol-gel (dip-coating) method. The obtained thin films were characterized by different techniques: X-ray diffraction (XRD), scanning electron microscope (SEM), atomic force microscope (AFM) and corrosion behaviour was carried out by potentiostatic (SIE) and potentiodynamic (Tafel diagrams) tests. The obtained results reveal an excellent corrosion protection efficiency that reached 98%.

Keywords: Corrosion; Stainless Steel; Sol-gel; ZnO; TiO_2; Electrochemical impedance spectroscopy.