EuroSciCon

International Conference on

Structural and Civil Engineering Research

October 01-02, 2018
Amsterdam, Netherlands

JET 2018 Volume: 7

DEPOSITION OF COATING TO PROTECT WASTE WATER RESERVOIR IN ACIDIC SOLUTION BY ARC THERMAL SPRAY PROCESS

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The corrosion characteristics of 304 stainless steel (SS) and titanium (Ti) coatings deposited by the arc thermal spray process in pH 4 solution were assessed. The Ti-sprayed coating exhibits uniform, less porous and adherent coating morphology compared to the SS-sprayed coating. The electrochemical study i.e. electrochemical impedance spectroscopy (EIS), revealed that as exposure periods to solution were increased, the polarization resistance (Rp) decreased and the charge transfer resistance (Rct) increased owing to corrosion of the metallic surface and simultaneously at the same time the deposition of oxide films/ corrosion on the SS-sprayed surface, while Ti coating transformed unstable oxides into the stable phase. Potentiodynamic studies confirmed that both sprayed coatings exhibited passive tendency attributed due to the deposition of corrosion products on SS samples, whereas the Ti-sprayed sample formed passive oxide films. The Ti coating reduced the corrosion rate by more than six times compared to the SS coating after 312 h of exposure to sulfuric acid (H_2SO_4) contaminated water solution, i.e. pH 4. Scanning electron microscope (SEM) results confirmed the uniform and globular morphology of the passive film on the Ti coating resulting in reduced corrosion. On the other hand, the corrosion products formed on SS-sprayed coating exhibit micro pores with a net-like microstructure. X-ray diffraction (XRD) revealed the presence of the composite oxide film on Ti-sprayed samples and lepidocrocite-γ-FeOOH) on the SS-coated surface. The transformation of TiO and Ti_3O into TiO_2 (rutile and anatase) and Ti_3O_5 after 312 h of exposure to H_2SO_4 acid revealed the improved corrosion resistance properties of Ti-sprayed coating.

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