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Preparation of Anticorrosive Titanium Iron Phosphate Layer on Iron Surface and Analyse the Impact of Preparatory Temperature of the Layer

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Abstract

Anticorrosive layers are one of the most widespread techniques to prevent iron from corrosion. A titanium rich (55,000 ppm) titanium iron phosphate contained leachate was prepared from dissolution of ilmenite in a concentrated phosphoric acid medium by refluxing. The required refluxing time (5 hours) was determined by colorimetry to achieve the maximum titanium concentration during experimental period. Prepared titanium iron phosphate contained leachate was applied onto clean iron surfaces while concentrated phosphoric acid applying as control specimens. Heat treatments were done on the layered iron pieces at the temperature range from 200° C to 1000° C. There were two same tests performed under each temperature. The corrosion rates were determined by the weight loss method and analysing the total iron dissolution rate in a prepared corrosion medium. The total iron dissolution rate was calculated using the colorimetric method based on the absorbance values of the orange color complex of ferrous ions and 1,10 phenanthroline. The graphs of corrosion rates at four hours immersion time versus the preparatory temperature were plotted for both methods. They indicate that high corrosion rates (0.062 $mgcm^{-2}h^{-1}$) at lower temperatures (around 200° C) and low corrosion rates (0.010 $mgcm^{-2}h^{-1}$) at the temperature range from 800° C to 900° C. Then the corrosion rate was gradually decreased when increase the preparatory temperature of layers. Then the corrosion inhibition efficiency values were calculated for each analysed preparatory temperatures with the help of calculated corrosion rates. When lower temperatures (around 200° C) were used, percentage inhibition efficiency of the respective layers was also low (4%) and the highest corrosion inhibition efficiency values (around 20%) were achieved at the preparatory temperature range from 800° C to 900° C during experimental period. According to the inhibition efficiency values, the temperature range from 800° C to 900° C for the preparation of layer is most suitable as it indicates the lowest corrosion rates.

Keywords: Ilmenite, iron, Anticorrosive layers, Corrosion rate, Anticorrosive efficiency