

CORROSION PREVENTION OF GALVANIZED STEEL USING EUGENOL EXTRACT IN HCl

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Corrosion inhibition of a metal is very important due to economical impact of corrosion. Galvanization is one of most widely used technique for corrosion inhibition of steel or iron due to low cost and high durability. Galvanized steel (GS) has a protective zinc coating which can prevent underling metal from corrosion by both ways; acting as a barrier for protection, and providing galvanic protection. However, galvanized coatings are very reactive and the extent of their corrosion depends on environmental conditions, such as pH and temperature. Also, the ability of zinc coating to protect underling metal depends on corrosion rate of zinc in a given environment. Therefore, it is important to understand corrosion mechanism of zinc, and take action to protect the zinc layer for high durability of galvanized steel.

Different types of synthetic corrosion inhibitors are available. Most synthetic inhibitors are very expensive and they are hazardous to the environment. Eugenol, isolated from cinnamon leaves by steam distillation, has shown effective corrosion inhibition of galvanized steel in 0.10 mol dm^{-3} NaCl medium at acidic pH of 1.0, 3.0 and 5.0. Open-circuit potential measurements, mass loss measurement, pH variation, electrochemical impedance spectroscopy, linier polarization curves and solution analysis were used to investigate the inhibition action of eugenol on galvanized steel. However, mass loss measurements may not be reliable at higher pH as corrosion products would get deposited on the surface due to solubility problems, requiring independent and more reliable corrosion monitoring techniques. Further, open circuit potential measurements (OCP) show that the variation of OCP decreases with increasing the eugenol concentration. Electrochemical impedance spectroscopy also shows a similar trend. Further, soluble content of Zn, determined by atomic absorption spectroscopy, is about 60% less in the presence of 0.5% inhibitor at pH = 1, which is even more significant at higher pHs. The multi-technique approach thus concludes that eugenol is an effective corrosion inhibitor for GS in pH 1.0, 3.0 and 5.0 and that the inhibition action increases with increase in the eugenol concentration.