COMPARATIVE STUDY OF INHIBITION EFFICIENCY USING DIFFERENT TYPES OF CORROSION INHIBITORS FOR DIFFERENT ALLOYS

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Abstract: To understand the mechanism of Synergistic corrosion inhibition, four different systems were selected with inorganic and organic Inhibitors. this covers both acid and alkaline corrosive media and different combinations of Inhibitors.

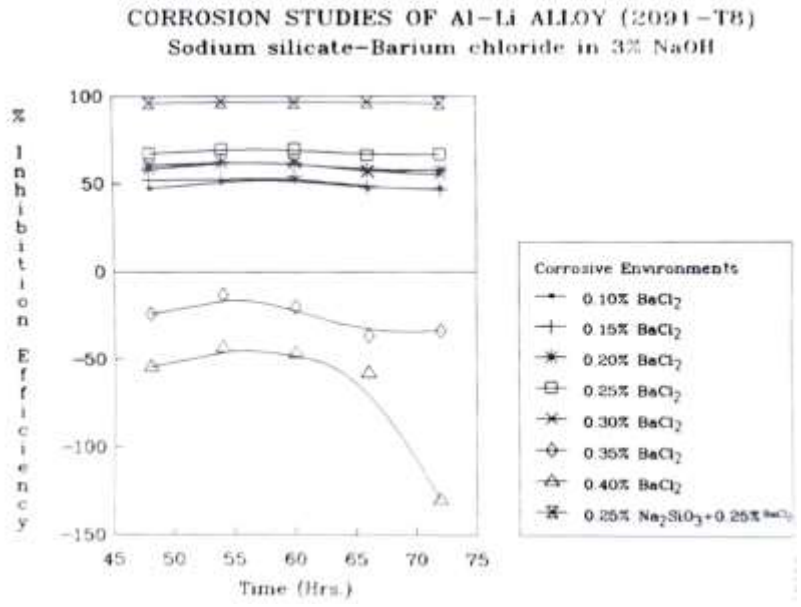
Keywords: Synergistic, Inorganic and Organic Inhibitors, Metal Alloys

Introduction

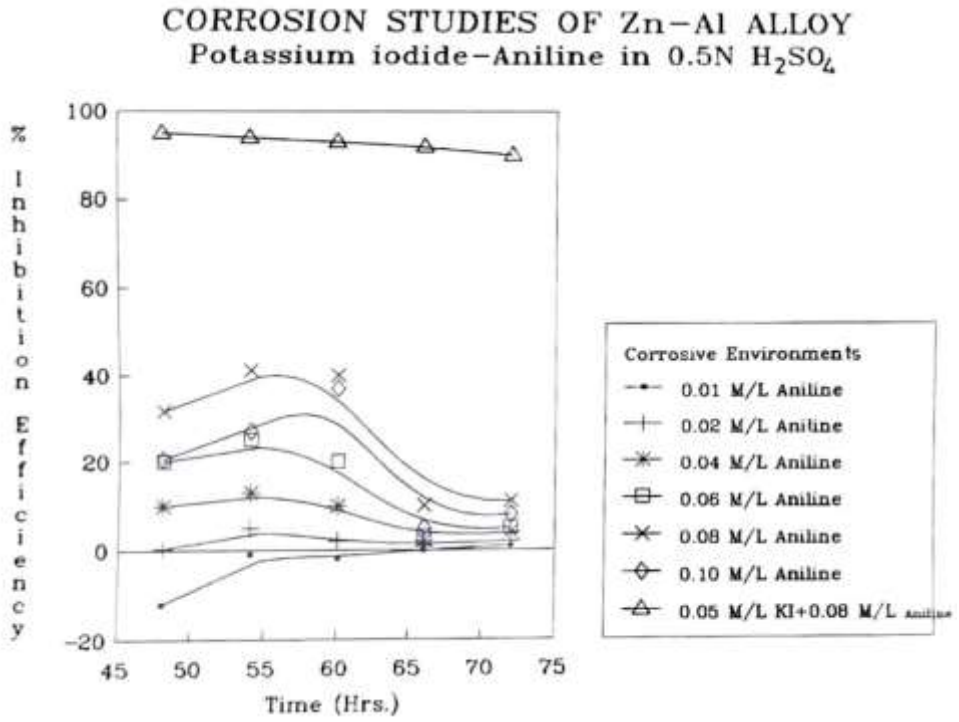
In chemical manufactures, the corrosion inhibitors were added in order to reduce the corrosion of mild steel. Generally, the corrosion event for different alloys is particularly prominent in these manufactures [1–6]. There are various approaches to reduce and impede metal corrosion, among which is to utilize various inhibitors [7–10]. Hence, the use of a metal corrosion in the corrosive environment is important not only for industrial uses but also for academic research.

Materials and Chemical Analyses

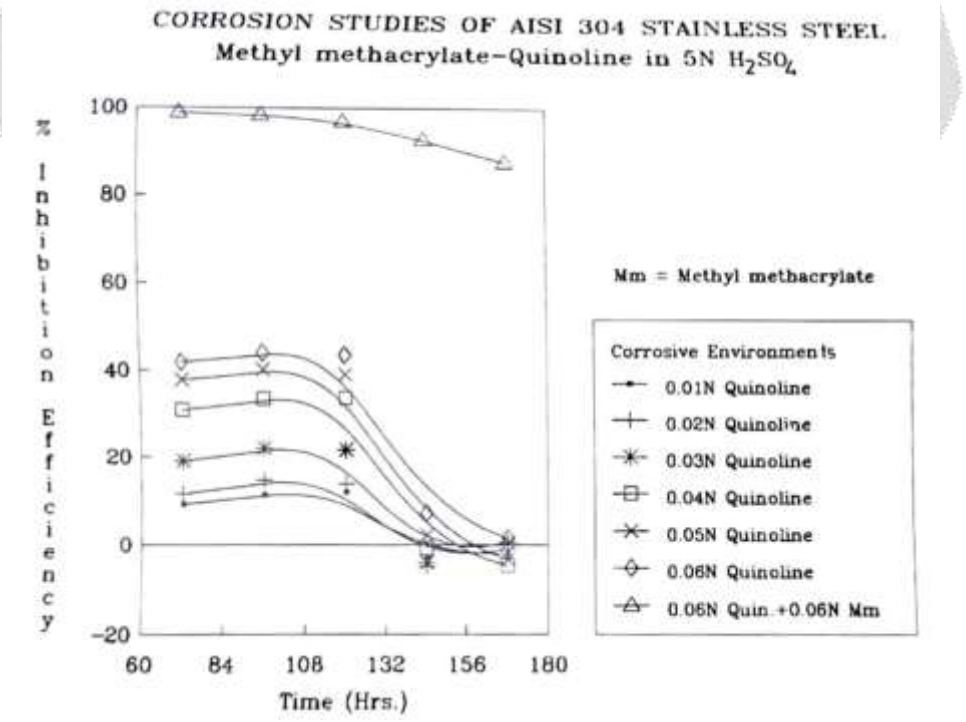
To understand the mechanism of synergistic corrosion inhibition, four different systems were selected (Figure 1.) with inorganic and organic inhibitors. Different combination of (A) both inorganic like $BaCl_2$ & Na_2SiO_3 in 3% NaOH for corrosion inhibition of Al-Li alloy (B) combination of one inorganic and one organic inhibitor like KI and aniline in 0.5N H_2SO_4 for corrosion inhibition of Zn-Al alloy and (C) both organic like quinoline and methyl methacrylate in 5N H_2SO_4 for corrosion inhibition of AISI 304 stainless steel have been studied. This covers both acid and alkaline corrosive media and different combinations of inhibitors. Such inhibitors like chromates, phosphates etc. have not been selected as a lot of research work has already been done on them and their passivating effect is large and may not give better understanding of synergistic effect with other inhibitor.



(A) both inorganic like $BaCl_2$ & Na_2SiO_3 in 3% NaOH for corrosion inhibition of Al-Li alloy



(B) combination of one inorganic and one organic inhibitor like KI and aniline in 0.5N H_2SO_4 for corrosion inhibition of Zn-Al alloy



(C) both organic like quinoline and methyl methacrylate in 5N H_2SO_4 for corrosion inhibition of AISI 304 stainless steel

Figure 1. Comparative study of Inhibition Efficiency using different types of corrosion inhibitors for different alloys

Result and Discussion

The following general deductions can be drawn from the four systems those have been studied and results are discussed as: All inhibitors showing synergistic effect act by adsorption/ chemisorption on the metal surface. The extent of adsorption/ chemisorption depends on the structure and nature of molecule or ion. Synergism is shown in both strong acidic and strong alkaline solutions. All anions are anodic inhibitors but organic inhibitors could be anodic, cathodic or mixed type. Organic bases, of course, are generally cathodic inhibitors.

Most of the inhibitors act within a certain range of concentration showing maximum inhibition at some optimum concentration. Beyond this range, they show stimulating effect. Some inhibitors accelerate corrosion rate at low concentration also. Again, the extent of stimulation and inhibition on the nature of inhibiting molecule or ion. Hackerman has also reported that the best inhibitor is also responsible for more acceleration of corrosion process in a particular medium. My results also confirm this view, the rate of desorption of metal ion along with the inhibiting ion or molecule is the rate determining step in all the cases which have been studied in this thesis.

Conclusion

A suitable mechanism could be easily proposed for them but it is desirable to carry out more experiments to determine the rate of reaction with respect to each reactant and the effect of temperature before such a mechanism be proposed. Inorganic anions are better inhibitors than organic inhibitors which have been studied and results are summarised.

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