SUMMARY

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Chapter 1 presents a brief historical survey of metallic corrosion and of corrosion inhibitors. It also gives the aim of the present investigation on organic inhibitors in acid corrosion of mild steel in the light of Antropov's hypotheses concerning zero-charge point. Stress has been laid on the importance of corrosion studies, and a broad classification of corrosion processes along with a short survey of different factors influencing them and of methods of protecting metals against corrosion has been made.

Chapter 2 provides a brief discussion on definition and classification of inhibitors and also surveys organic inhibitors of corrosion and their applications with special reference to those with oxygen, nitrogen and sulphur containing inhibitors. It mentions different techniques for investigation of inhibition phenomena.

Chapter 3 discusses mechanism of inhibition action of different classes of inhibitors with special reference to those of the organic inhibitors. The role of structural parameters on adsorption and inhibition as well as the role of electrode metal viz. anodic and cathodic zones, purity, double layer and surface charge etc. on inhibition has been elaborated, supported by relevant references from literature sources.

Chapter 4 points out a relationship between electrocapillarity and corrosion inhibition and mentions the importance of 'potential of zero-charge' or 'electrocapillary maximum' in the studies of corrosion inhibition. It further discusses thermodynamic principle of electrocapillary phenomena and its experimental investigation with capillary electrometer. Effects of different types of surface active species on the morphology of the electrocapillary curves have been mentioned.

Chapter 5 provides definition of the concept as well as physical significance of 'phi-scale of potentials' on the basis of 'null-point' of the metal. It also discusses probable applications of the scale in electrochemical problems involving adsorption with special reference to corrosion inhibition. The relationship of the 'phi-potential' to the structure of electrical double layer at metal/solution interface, to the distribution of charges on a corroding surface and to the adsorption of organic corrosion inhibitors has been pointed out. The depression of electrocapillary curves due to adsorption of organic compounds on mercury at $\varphi = -0.26$ volt, which is the corrosion potential of iron in acid solution in 'phi-scale', has been theoretically correlated to the inhibition coefficient of different organic inhibitors as obtained in the case of mild steel in acid solution; this has subsequently been verified within certain

limitations. Methods for evaluation of surface charge on the metal q_M, and of surface excess of adsorbed species Γ_{org}, have been noted.

Chapter 6 deals with the experimental details of the present study. The results have been recorded in forms of tables and graphs. Methods of calculation of surface tension γ, surface charge q_M and surface excess Γ_{org}, and possible sources of errors in the experimental procedure as well as in derivation of different results have also been discussed. Analytical differentiation by IBM 1620 computer and graphical differentiation by mirror method have been made in deriving results of q_M and of Γ_{org} respectively.

Chapter 7 is devoted to the interpretation of the experimental and derived results obtained in the previous chapter. Discussion has been made with respect to three classes of compounds viz. monohydric aliphatic alcohols, polyhydric aliphatic alcohols and thioureas studied in the present investigation under three different headings viz. (i) electrocapillarity and adsorption and their relation with the inhibition of mild steel corrosion in acid medium, (ii) variation of surface charge on the mercury surface due to variation of potential between metal/solution interface and its effect on adsorption of organic compounds on metal surface and (iii) variation of surface excess with applied potential and surface charge on metal. Corrosion inhibition

of these classes of compounds has also been interpreted in the light of the functional group, stereochemical configuration of the inhibitor and the non-coulombic metal-inhibitor interactions. The application of 'phi-scale of potentials' and its limitations in dealing with the quantitative determination of inhibition effect on acid corrosion of mild steel by different organic inhibitors have been discussed from the point of view of precise determination of 'null-points' of metals and a precise knowledge of the nature of the corrosion process in a given environment.

In the concluding chapter 8, significant points of observation regarding the application and limitations of 'phi-scale of potential' in the studies of organic corrosion inhibitors of mild steel in sulphuric acid medium, have been recorded.
