Chapter 3

Results & Discussion

Section (A)

Effect of Investigated Azo dyes on The Corrosion Behavior of Carbon Steel in 2M HCl Solution by The Mass loss Technique

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3.1- Corrosion inhibition behavior

The corrosion behavior of carbon steel in aqueous environment is characterized by the extent to which it dissolves in the solution. This can be quantified using the simple relationship:

$$\Delta W = W_B - W_A \qquad (3.1)$$

where :

ΔW = loss in mass of metal in the corrosive solution.

W_B = loss in mass of metal before exposure to the corrosive solution.

W_A = loss in mass of metal after exposure to the corrosive solution.

The degree of dissolution of course, dependent on the surface area of the metal exposed and the time of exposure; hence the amount of corrosion is given with respect to area and time. The resulting quantity, corrosion rate is thus a fundamental measurement in corrosion science. Corrosion rate can be evaluated by measuring either the concentration of the dissolved metal in solution by chemical analysis or by measuring weight of a specimen before and after exposure and applying equation (3.1). The later is most common method. The

mass loss method is usually preferred because the quantity measured is directly related to the extent of corrosion and does not rely on any assumptions about reactions occurring during corrosion.

Figures (3.1 – 3.5) show the mass loss-time curves in 2M HCl solution in absence and presence of different concentrations of the selected organic compounds. Inspection of these Figures it is clear that, as the concentration of these compounds increases, the loss in mass of carbon steel samples decreases. This means that the presence of these compounds retard the corrosion of C-steel in 2M HCl or in other words, these compounds act as an inhibitors.

The linear variation of mass loss with time in uninhibited and inhibited 2M HCl indicates the absence of insoluble surface film during corrosion. In the absence of any surface film, the inhibitors are first adsorbed onto the metal surface and thereafter impede corrosion either by merely blocking the reaction sites (anodic and cathodic) or by altering the mechanism of the anodic and cathodic processes.

The percentage inhibition efficiency (%P) of the selected organic compounds were determined by using the following equation:

$$\%P = \frac{W_{free} - W_{add}}{W_{free}} X\ 100 \qquad (3.2)$$

where W_{free} and W_{add} are the loss in mass of carbon steel in the absence and presence of the selected organic compounds, respectively.

The calculated values of $\%P$ are given in Table (3.1) at 30°C. The order of the inhibition efficiencies of these compounds, decreases in the following sequence:

II > III > I > V > IV

This behavior will be discussed later .