RESULTS AND DISCUSSION

SECTION (A)

STUDYING THE CORROSION BEHAVIOR OF ALUMINIUM BY THE CHEMICAL TECHNIQUE

The influence of N-thiazolyl-2-cyanoacetamide derivatives and N-thiazolyl-2-cyano-2-propeneamide derivatives on the corrosion behavior of aluminium in 0.01N sodium hydroxide was studied using the weight-loss technique as the chemical testing technique.

3.1- Corrosion Inhibition Behavior

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

$$W_o = W_B - W_A \qquad (3.1)$$

where:

W_o= weight of metal loss in the corrosive solution.

W_B= weight of metal before exposure to the corrosive solution.

W_A= weight 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 rates 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 weight-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 (3.1-3.6) show the weight loss-time curves for aluminium in 0.01N sodium hydroxide in absence and presence of different concentrations of the selected organic compounds. As shown in these Figures, by increasing the concentration of these compounds, the weight loss of aluminium samples are decreased. This means that the presence of these compounds retards the corrosion of aluminium in 0.01N sodium hydroxide or in other words, these compounds act as an inhibitor.

The linear variation of weight loss with time in uninhibited and inhibited 0.01N NaOH indicates the absence of insoluble surface films during corrosion. In the absence of any surface films, 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 partial processes.

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

$$\%P = (W - W') / W \times 100 \qquad (3.2)$$

where W and W' are the corrosion rates of aluminium in the absence and presence of the selected organic compounds, respectively, at given time period and temperature.

From the calculated values of %P given in Table (3.1) at 30°C, the order of the inhibition efficiencies of the selected organic compounds decreases in the following sequences:

i) *For N-thiazolyl-2-cyanoacetamide derivatives*

Compound (c) > Compound (b) > Compound (a).

ii) *For N-thiazolyl-2-cyano-2-propeneamide derivatives*

Compound (f) > Compound (e) > Compound (d).