SECTION (A)

RESULTS AND DISCUSSION

SECTION (A)

STUDYING THE CORROSION BEHAVIOUR OF 1018 C-STEEL BY THE CHEMICAL TECHNIQUE

To evaluate the influence of aminopyrimidine compounds on the corrosion of 1018 C-steel in 0.05M nitric acid, the weight-loss technique was employed as the chemical testing technique.

3.1 Corrosion inhibition behaviour

The corrosion behaviour of a metal 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:

$$\Delta W = W_1 - W_2 \qquad (3.1)$$

where:

ΔW = weight loss of metal in the corrosive solution.

W_1 = weight of metal before exposure to the corrosive solution.

W_2 = 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 concentrtion 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 (3.1-3.4) show the weight loss-time curves for 1018 C-steel in 0.05M HNO_3 acid in absence and presence of different concentrations of aminopyrimidine derivatives. As shown in these Figures, by increasing the concentration of these compounds , the weight loss of 1018 C-steel samples are decreased . This means that the presence of these compounds retard the corrosion of C-steel in 0.05 M nitric acid or in the other words, these compounds act as inhibitors.

The increasing of weight loss with time in uninhibited and inhibited 0.05M HNO_3 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 processes.

Increase in bulk concentration and consequently increase of surface coverage which led to a decrease in C-steel dissolution and increase in persentage inhibition.

Table (3.1) shows the percentage inhibition of different organic inhibitors at different concentrations after 90 minutes immersion from the start for each concentration and for all additives. Where percentage inhibition (%IE) for aminopyrimidine compounds were determined by using the equation :

$$\% \text{ IE} = (1 - W_o\text{inh.} / W_o\text{free}) \times 100 \qquad (3.2)$$

where $W_o$free and $W_o$inh. are the weight loss of 1018 C-steel in the absence and presence of aminopyrimidine, respectively at given time period and temperature .

From the calculated values of %IE given in Table (3.1) the order of the inhibition efficiences of aminopyrimidine derivatives is : IV > III > II > I

Table (3.1):

Inhibition efficiency of all inhibitors at different concentrations of inhibitors as determined by weight loss method at 30 °C

[Inhibitor], M	% IE			
	I	II	III	IV
7×10^{-6}	9.86	17.27	20.87	25.68
9×10^{-6}	13.65	25.30	26.96	32.33
11×10^{-6}	22.65	31.03	37.60	41.19
13×10^{-6}	26.28	35.98	39.77	45.07
15×10^{-6}	30.41	39.77	44.83	48.47
17×10^{-6}	36.26	42.65	48.47	53.27

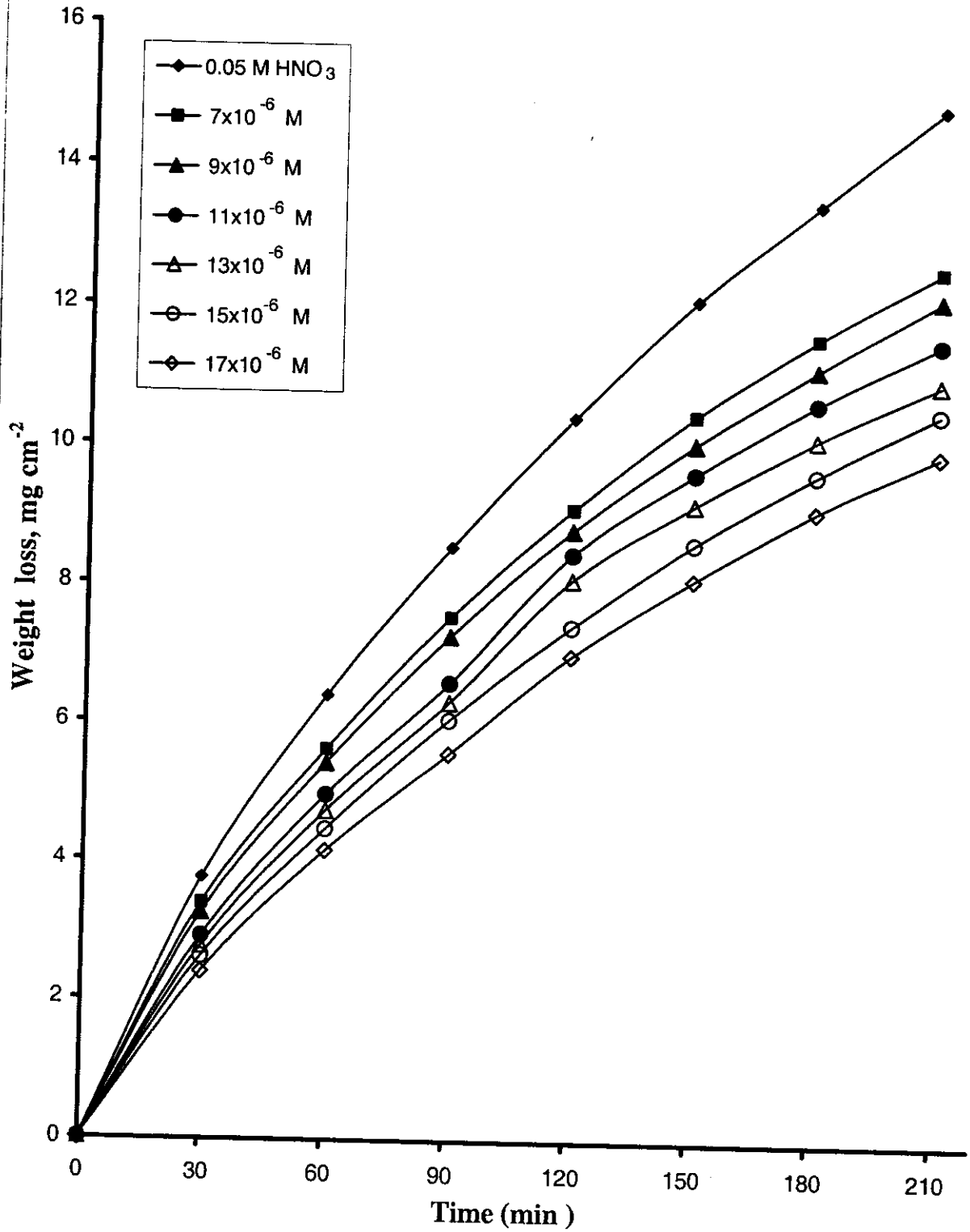

Fig.(3.1): Weight loss-time curves for C-steel dissolution in 0.05 M HNO_3 in presence and absence of different concentrations of inhibitor (I)

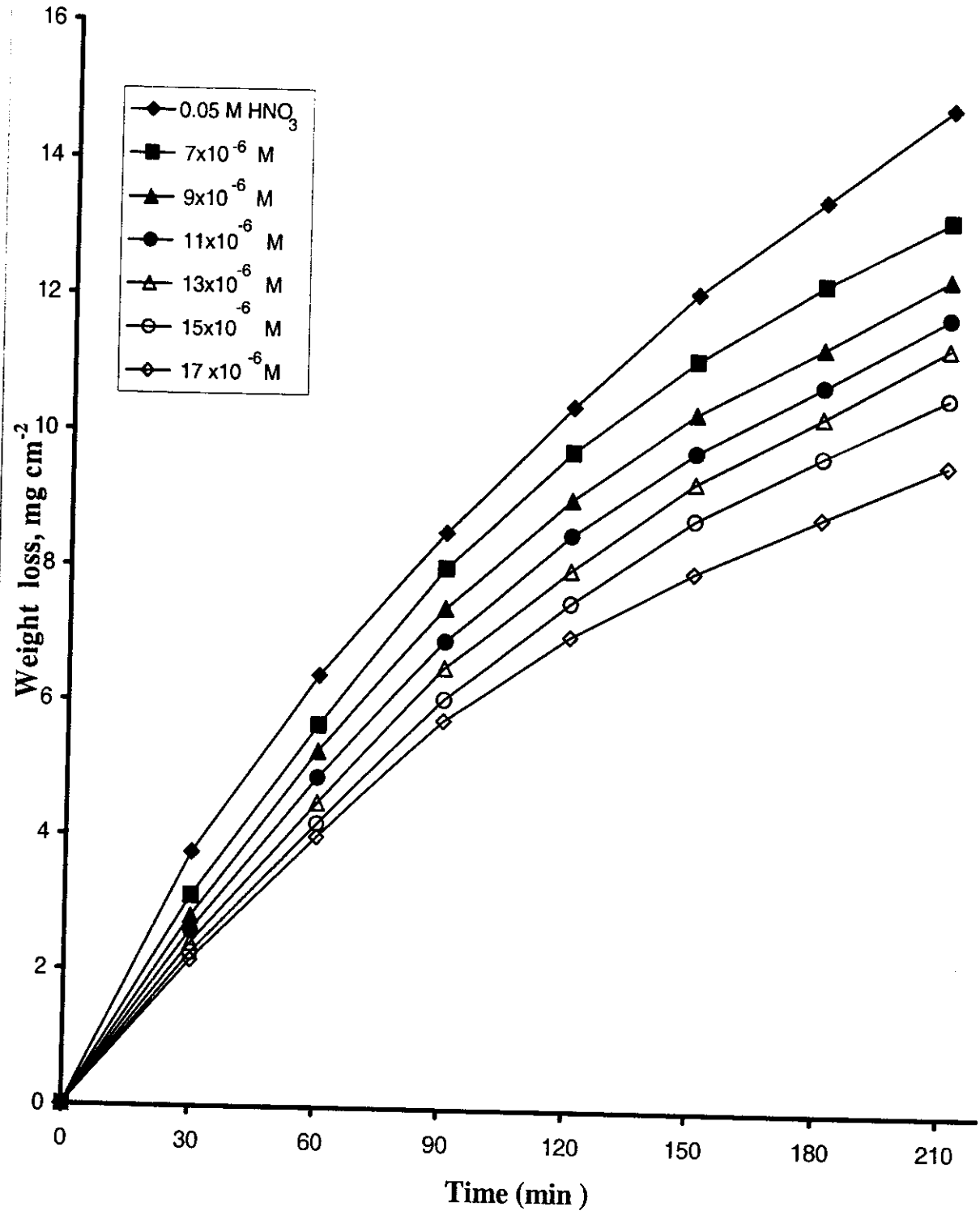

Fig.(3.2): Weight loss-time curves for C-steel dissolution in 0.05 M HNO_3 in presence and absence of different concentrations of inhibitor(II)

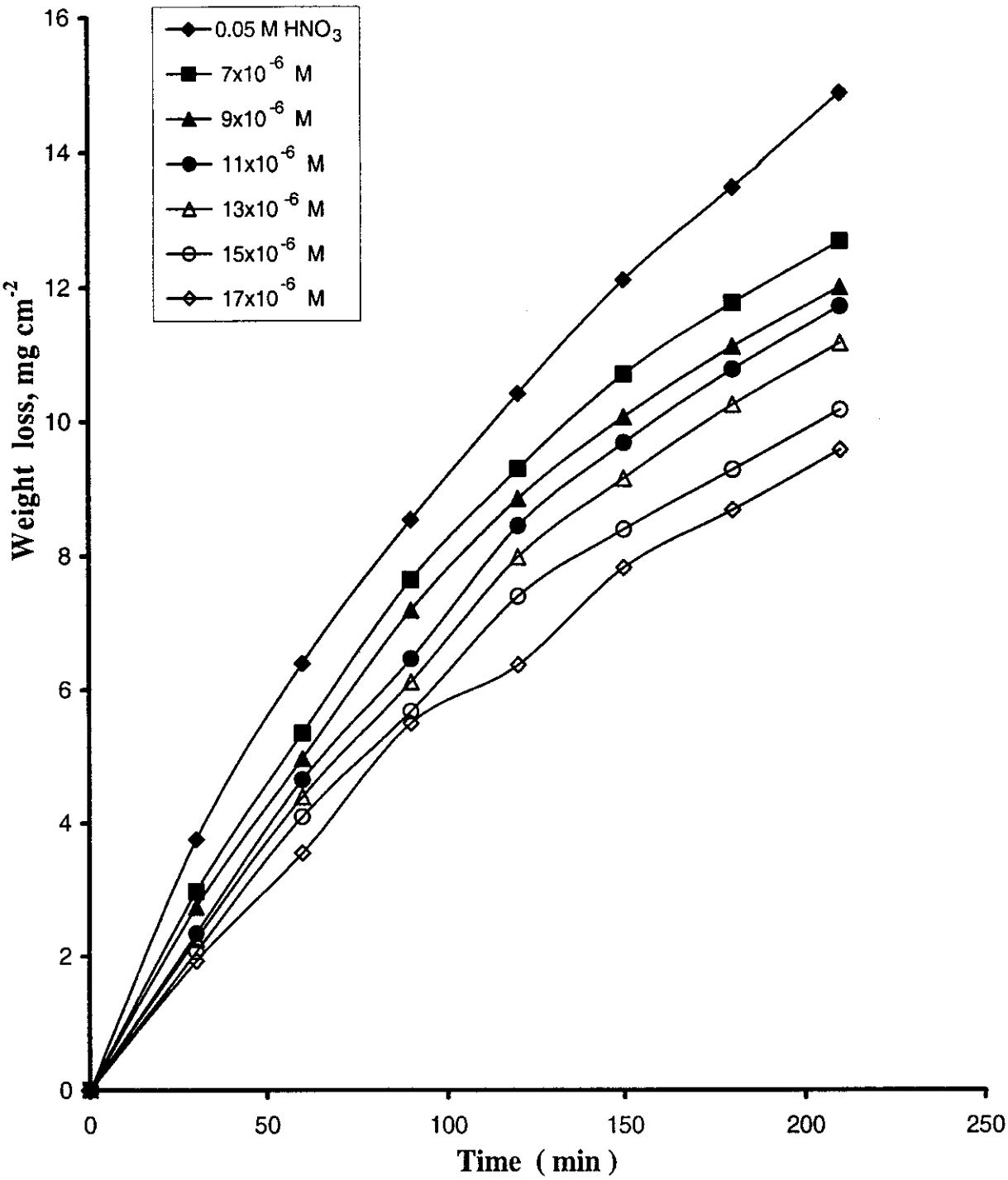

Fig.(3.3): Weight loss-time curves for C-steel dissolution in 0.05 M HNO_3 in presence and absence of different concentrations of inhibitor(III)

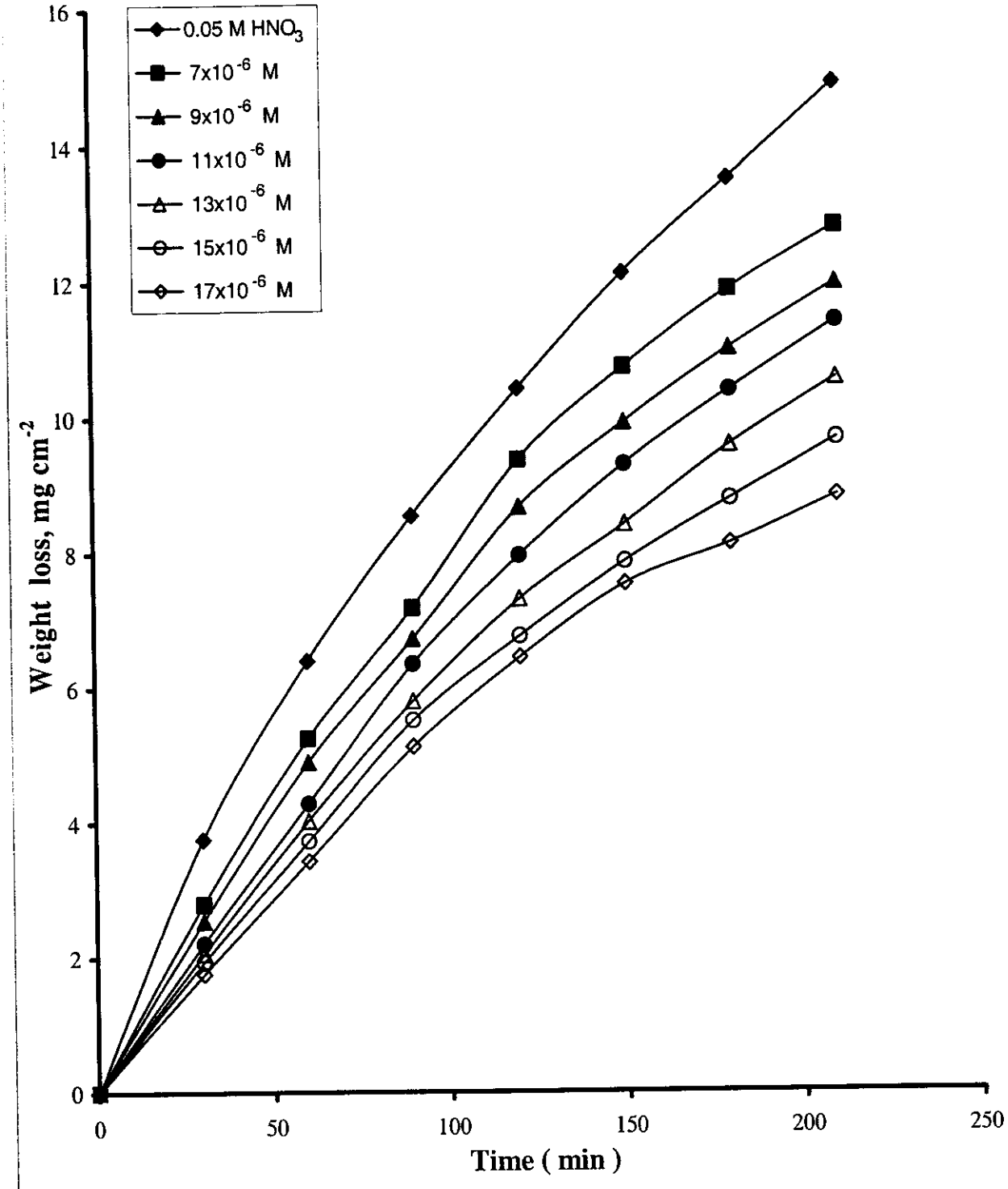

Fig.(3.4): Weight loss-time curves for C-steel dissolution in 0.05 M HNO_3 in presence and absence of different concentrations of inhibitor(IV)