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Study of organic compounds containing - NH_2 and - COOH groups as corrosion inhibitor

S.M. BHAGAT, D.G . KOLHATKAR, A.R. UNCHADKAR and M.N. DESHPANDE

P.G. Department of Chemistry, N.E.S. Science College, Nanded (India).

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ABSTRACT

Oxidation of metal is a corrosion , it's a slow process. In various medium , the corrosion of metal takes place . Certain organic compounds act as the corrosion inhibitors, Various experiments were conducted to study the inhibition efficiency of different compounds like p-nitroaniline, m-nitroaniline , p-toludine and benzoic acid, salicylic acid ,phthalic acid , and cinnamic acid . The values shows inhibition of corrosion action of the organic compounds.

Key words: Study of inhibition efficiency of organic compounds containing -NH_2,-COOH functional group.

INTRODUCTION

The references indicates that organic compounds containing –NH_2 , -COOH groups retards the corrosion action of metal. This may be due to the formation of surface layer , also may be due to retardation of oxidation.

The various organic compounds containing –NH_2 , and -COOH group are used to study the inhibition efficiency of organic compounds . The results are very interesting.

EXPERIMENTAL

To study the inhibition efficiency of organic compounds. The simple experiments were carried out. In this experiments the beakers were labeled from 1-12 and in beakers hiving labeled 1,2,3,4, 25ml 0.5N HNO_3, and in beakers 5,6,7,8 0.5N HCl and in beaker number 9,10,11,12 , 0.5N H_2SO_4 were added . In each beaker the different organic compound like p-nitroaniline, m-nitroaniline, p-toludien and acids Benzoic acid, salicylic acid, cinnamic acid, pthalic acid each were added. The temp. were recorded .

The binding wire were cleaned first by regmal paper and wash with water and its weight were determined on analytical balance. The loss in mass were determined using the relation.

$$I.E. = \frac{Wu - Wi}{Wu} \times 100$$

Where
IE= Inhibition efficiency,
Wi= Weight loss of metal in inhibitor solution
Wu= Weight loss of metal in unhibited solution (control) relation.

Inhibition efficiency were determined. The inhibition efficiency of organic compound in different oxidizing medium were used for comparisons.

RESULTS AND DISCUSSION

Regarding organic bases-refer table No.1

Inhibition efficiency figures indicates that all organic acid acting as inhibitors, Inhibition efficiency of all organic bases are not same but the inhibition action remains in the same proportion.

Inhibition efficiency table indicates that the p-Toludien is good corrosion inhibitor. It is inhibition efficiency values in Nitric acid medium is 84.38 . Inhibition efficiency value in HCl medium34.18 and in H_2SO_4 medium its inhibition efficiency 28.41.

Inhibition efficiency value of p-nitroaniline is weak as compared to m-nitroaniline and p-toludien . The ingibition efficiency of organic base containing the nitro group is less as compared to organic bases containing methyl radical. The organic bases containing nitro group having electron density towards itself there by they decreases the basic nature $–NH_2$ group present in the compound. The position of nitro group also affect inhibition efficiency of organic compound.

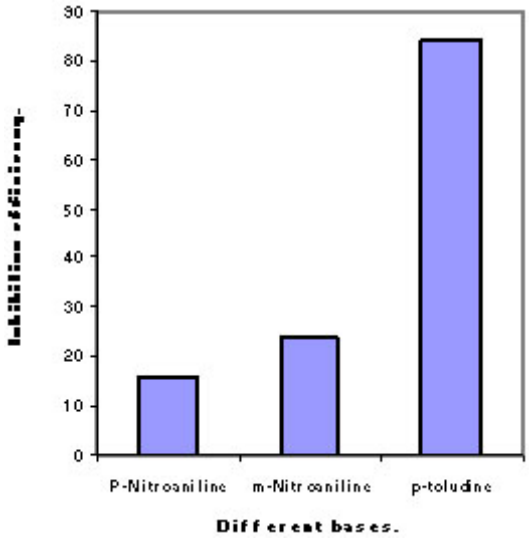

Fig. 1: Effect of organic bases on corrosion of steel in 0.5N Nitric acid media

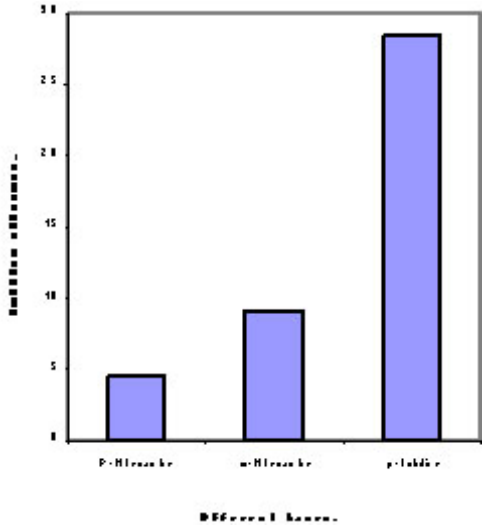

Fig. 2: Effect of organic bases on corrosion of steel in 0.5N Nitric sulphuric acid media

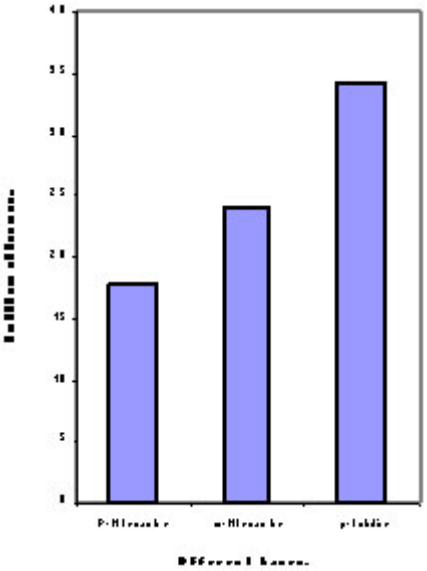

Fig. 3: Effect of organic bases on corrosion of steel in 0.5N Hydrochloric acid media

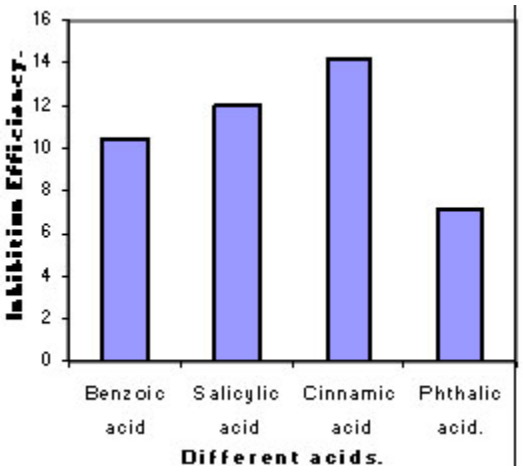

Fig. 4: Effect of organic bases on corrosion of steel in 0.5N Nitric acid media

Table 1: Effect of organic bases on corrosion of steel in 0.5 N Nitric acid media

Beaker No	Organic compound	Initial weight	Final weight	Loss in Weight	% loss in weight	Inhibition efficiency
1	Control	1.358	1.134	0.224	16.5	0
2	P-Nitroaniline	1.37	1.181	0.189	13.8	15.63
3	m-Nitroaniline	1.371	1.201	0.17	23.6	24.11
4	p-toludine	1.098	1.063	0.035	3.5	84.38

Regarding organic acids refer Table No.2

To study inhibition efficiency the different acids are used . The Benzoic acid is simple acid, salicylic acid is organic acid containing OH group cinnamic acid is unsaturated acid while pthalic acid is dicarboxylic acid .there inhibition efficiencies are different . The result indicate that inhibition efficiency of phthalic acid in HNO_3 ,HCl ,H_2SO_4 is low .The inhibit tionefficiency of cinnamic acid is more also the figures indicates that the inhibition efficiency also depends upon the nature of oxidizing medium/

The antioxidizing behavior of different organic acid is more in case of hydrochloric acid medium table 2-6.

If comparison is made between the inhibition efficiency of different bases and acids in oxidizing agent. It is found that the bases are more inhibitors towards corrosion as compared to organic compounds containing carboxy acid group.

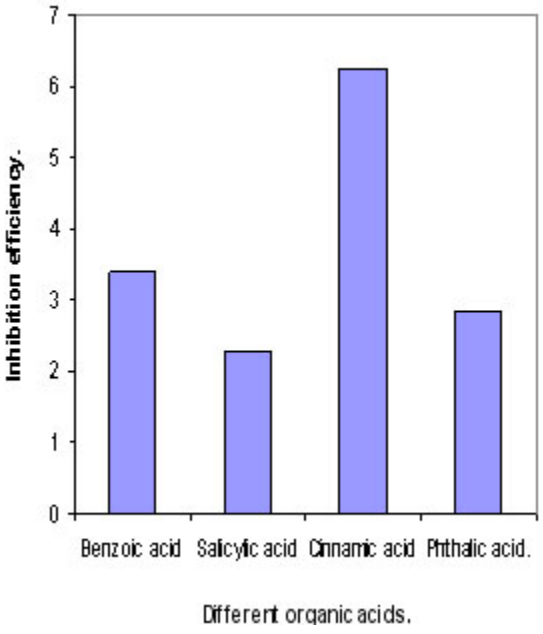

Fig. 5: Effect of organic bases on corrosion of steel in 0.5N Sulphuric acid media

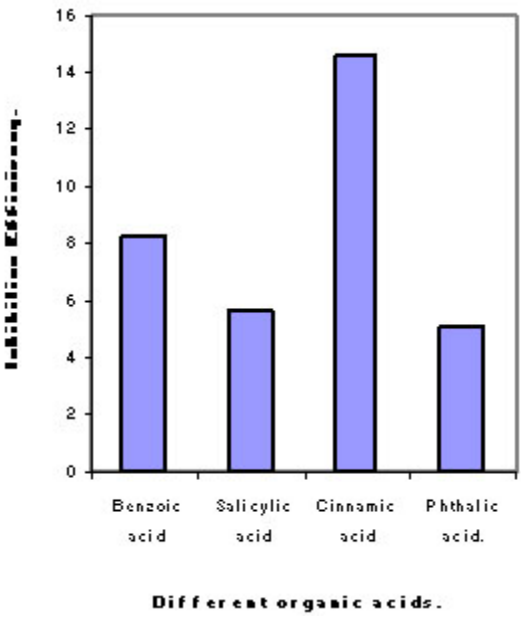

Fig. 6: Effect of organic bases on corrosion of steel in 0.5N Hydrochloric acid media

Table 2: Effect of organic bases on corrosion of steel in 0.5 N sulphuric acid media

Beaker No	Organic compound	Initial weight	Final weight	Loss in Weight	% loss in weight	Inhibition efficiency
5	Control	1.115	0.939	0.176	15.7	-
6	P-Nitroaniline	1.120	0.952	0.168	15.0	4.50
7	m-Nitroaniline	1.084	0.924	0.160	14.7	9.09
8	p-toluidine	1.144	1.018	0.126	10.8	28.41

Table 3: Effect of organic bases on corrosion of steel in 0.5 N Hydrochloric acid media

Beaker No	Organic compound	Initial weight	Final weight	Loss in Weight	% loss in weight	Inhibition efficiency
9	Control	1.171	1.013	0.158	13.5	-
10	P-Nitroaniline	1.047	0.917	0.130	12.4	17.72
11	m-Nitroaniline	1.099	0.979	0.120	10.9	24.05
12	p-toluidine	1.166	1.069	0.104	8.9	34.18

Table 4: Effect of organic acid on corrosion of steel in 0.5 N Nitric acid media

Beaker No	Organic compound	Initial weight	Final weight	Loss in Weight	% loss in weight	Inhibition efficiency
	Benzoic acid	1.172	0.971	0.201	17.1	10.5
	Salicylic acid	1.118	0.921	0.197	17.6	12.05
	Cinnamic acid	1.202	1.01	0.192	15.9	14.20
	Phthalic acid.	1.263	1.055	0208	16.5	7.14

Table 5: Effect of organic acid on corrosion of steel in 0.5 N sulphuric acid media

Beaker No	Organic compound	Initial weight	Final weight	Loss in Weight	% loss in weight	Inhibition efficiency
	Benzoic acid	1.274	1.104	0.170	13.3	3.40
	Salicylic acid	1.252	1.080	0.172	13.7	2.27
	Cinnamic acid	1.239	1.404	0.165	13.3	6.25
	Phthalic acid.	1.216	1.045	0.171	14.0	2.84

Table 6: Effect of organic on corrosion of steel in 0.5 N Hydrochloric acid media

Beaker No	Organic compound	Initial weight	Final weight	Loss in Weight	% loss in weight	Inhibition efficiency
	Benzoic acid	1.279	1.134	0.145	11.5	8.22
	Salicylic acid	1.259	1.11	0.149	11.8	5.69
	Cinnamic acid	1.252	1.117	0.135	10.7	14.55
	Phthalic acid.	1.192	1.042	0.150	12.6	5.06

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