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EFFECT OF ANTICORROSION INHIBITOR OF CUCURBIT[n]URILS' CONCENTRATION ON ANTICORROSION INHIBITION MECHANISM

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Abstract
In our research work we have synthesized new kinds of anticorrosion inhibitor based on cucurbit[n]urils. It was investigated effect of cucurbit[n]urils' concentration on anticorrosion inhibition mechanism on the №3 steel surface. During this experiment it was used thermodynamic methods.

Keywords: corrosion, inhibition, cucurbit[n]urils, protective films, chemical complex.

Introduction

The steel metal materials are commonly used in Uzbekistan's industries, as a result, it is mainly part of construction materials industries. Hydrochloric acid solutions are used in industrial processes during pickling and cleaning salts films of metals; that causes significant metal loss. The inhibitors are added to the acid solution to minimize acid attack on metal. The corrosion inhibitors are the chemical compounds which at addition in corrosion system at a small concentration adsorbed on the metal surface, connects with metal ions and decreases the corrosion rate. Inhibitors can react with a metallic surface or the environment, forming protection films which are metallic oxide, anodic film, thin film, chemical complex with metal ions, supramolecular substance or absorbs ion film on the metal surface [1-5].

Corrosion inhibitors are classified in depending on the metal construction and the environment type. They are divided on the environmental conditioners and interface inhibitors. Liquid-phase inhibitors are classified as anodic, cathodic or mixed inhibitors depending on whether they inhibit the anodic, cathodic or both electrochemical reactions. This kind of inhibitors widely used in our republic factories.

Results and Discussion

In our experiment we have investigated effect of anticorrosion inhibitor of cucurbit[n]urils' concentration on inhibition mechanism. These synthetic inhibitors adhere on the metal surfaces and form a protecting surface film at the metal/electrolyte interfaces. The adsorption of the synthetic inhibitors on the metal surface depends upon numerous factors including the nature and number of potential adsorption sites along with the nature of the metal and testing medium [6-7].

Table 1 Anticorrosion parameters of №3 steel in 10% HCl medium in the presence and absence of cucurbit[n]urils inhibitor obtained from gravimetric method.

Inhibitor	Temperature, K	Concentration, mg/l	CR, mmy^{-1}	θ	η, %
Blank	303	-	25,3		-
Cucurbit[n]urils		100	1,80	0,9288	92,88
		150	1,42	0,9438	94,38
		200	1,20	0,9679	96,79
		250	1,01	0,9802	98,02
Blank	313	-	57,1	-	-
Cucurbit[n]urils		100	4,80	0,9159	91,59
		150	3,71	0,9350	93,50
		200	3,50	0,9387	93,87
		250	2,84	0,9502	95,02
Blank	323	-	95,6		
Cucurbit[n]urils		100	9,22	0,9035	90,35
		150	8,43	0,9118	91,18
		200	7,90	0,9173	91,73
		250	6,41	0,9329	93,29

Table 2 Anticorrosion parameters of №3 steel in 10% HCl medium in the presence and absence of inhibitors obtained from gravimetric method (T= 303 K; C=100 mg/l).

№	Inhibitors	CR, mmy^{-1}	θ	η, %
1	Blank	25,3	-	-
2	Glycoluril	2,50	0,9011	90,11
3	Cucurbit[n]urils	1,80	0,9288	92,88
4	DBIT	1,19	0,9529	95,29
5	BTGU	1,20	0,9525	95,25
6	BTI	1,18	0,9533	95,33
7	Mixed product	1,65	0,9347	93,47
8	Cucurbit[n]urils adduct	1,50	0,9407	94,07
9	CB[n]+GPL	1,63	0,9355	93,55
10	DIT	1,85	0,9268	92,68
11	“Nalco” 352	1,84	0,9272	92,72
12	“Nalco” 356	1,82	0,9280	92,80

All investigation inhibitors were contrasted “Nalko” 352 and 356 (Company of USA) inhibitors during gravimetric experiments. It was noticed from the contrasting results the investigated inhibitors’ anticorrosion properties were same “Nalko” company’s inhibitors. However the DBIT, BTGU and BTI inhibitors were good adsorbed than “Nalko” 352 and 356 inhibitors.

It was shown from table 1 that the variation of the corrosion rate and percentages of inhibition efficiency have obtained at different cucurbit[n]urils’ concentrations and 303-323 K temperatures in 10% HCl medium by gravimetric experiments [7]. The results have shown that the η% increased on increasing the cucurbit[n]urils’ concentrations and its maximum values

was obtained at 250 mg/l. A further increase in concentration did not cause any significant change in the inhibition performance. It was clear from table 1 that the cucurbit[n]urils have 92,88 at 303 K; 91,59 at 313 K and 90,35 at 323 K corrosion protection degrees in strong acid medium at 100 mg/l. So this concentration was optimum concentration for this inhibitor in this medium because this concentration has achieved huge protection degree with contrasting other. It may be possible that the using this inhibitor in strong acid mediums with aim of protecting steel materials from corrosion destruction.

Conclusion

Results show that cucurbit[n]urils anticorrosion inhibitors are effective at different temperatures. At 323 K temperature cucurbit[n]urils are more effective with 90.35 % (protective degree) at 100 ppm concentration.

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