TECHNICAL REPORT

METHYL BENZOTHIAZOLE AS A CORROSION INHIBITOR FOR COPPER AND BRASS IN CHLOROSUBSTITUTED ACETIC ACIDS

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2-Methyl benzothiazole is investigated as an inhibitor of corrosion for copper and brass in 0.1N acetic and chloroacetic acids. It is found to be a fairly good inhibitor. The electrochemical behaviour of the metals with inhibitor in trichloroacetic acid is demonstrated by reference to polarization curve and Tafel's plot.

The chloroacetic acid is manufactured and utilized in cellulose industry. It is corrosive to copper and its alloys. It appears that extensive corrosion problem has to be faced in industrial practice. The object of this investigation is to suggest an effective inhibitor, when vessels of copper and copper alloys are used with these acids. 2-Methyl benzothiazole is a fairly good inhibitor for copper and brass.

For immersion of specimen (Copper : Cu = 99.6%; Brass : Cu = 63.2% and Zn = 36.6%), 250ml solutions of 0.1N acids were used The duration of the experiment was 2 days and the temperature was 30±2°C. The influence of current densities on the system was also carried out as described by Trivedi et al[1].

The concentration of the inhibitor used was 200ppm which gave maximum protection. Results are given in Table 1 and in Figs 1 and 2. The current density was varied from 25μA to 2.5 mA/Sqcm.

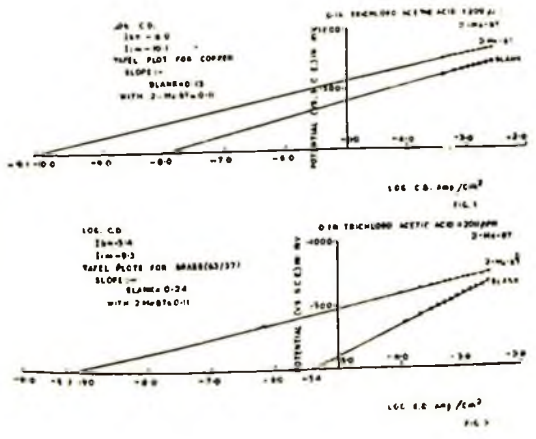


Table 1. Loss in wt. data for corrosion of copper and brass (63/37) in acetic acids with 2-methyl-benzothiazole.

Temp 30±2°C Medium	Inhibitor, ppm	Duration 2 days. % Inhibition	
		Copper	Brass
0.1N	00	—	—
Acetic	10	34	51
acid	20	54	79
	40	68	82
	100	74	83
	200	74	85
0.1N	00	—	—
Monochloro	10	00	36
acetic	20	27	41
acid	40	54	54
	100	59	60
	200	71	75
0.1N	00	—	—
Dichloro	10	55	60
acetic	20	57	66
acid	40	61	69
	100	73	70
	200	78	72
0.1N	00	—	—
Trichloro	10	86	92
acetic	20	87	93
acid	40	91	94
	100	93	94
	200	93	95

2-Methylbenzothiazole forms complexes with $Cu_2(NO_3)_2$. The formula of the complex is $Cu\ (2\text{-}MeBT)_2(NO_3)_2$. It seems that the inhibition afforded by 2-methylbenzothiazole is due to the formation of metal complexes. The inhibition increases with concentration of the inhibitor. The concentration of 200ppm is effective in all chloroacetic acids for copper and brass.

It is considered that copper-2-methylbenzothiazole complex acts as an inhibitor as well as physical barrier due to the formation of an insoluble coherent thin and non-porous complex film. Similar type of mechanism may also be visualized for zinc.

The rise in cathodic potential on addition of 2-methylbenzothiazole may be due to the formation of an insoluble film on cathode. The cathodic potential will vary as determined by Tafel's rule or in other words, at the same cathodic potential, the apparent current density falls in presence of inhibitor. On extrapolation of Tafel's plot in the absence and in the presence of inhibitor, one can determine the current density at steady state potential. (Figs. 1 and 2). The inhibition efficiency $(I_b - I_c)/I_b$ agrees well with that calculated by loss in weight method.

The inhibition efficiency and Tafel's Slope determined for copper and brass with trichloroacetic acid are summarized below :

	Current density (A/Sq cm.)		Slope		% Inhibition
	I_b	I_c	Blank	with 2Me-BT	
Copper	1.00×10^{-8}	0.8×10^{-11}	0.13	0.11	100
Brass	3.99×10^{-6}	5.00×10^{-10}	0.24	0.11	100

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REFERENCES

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2. E.J. Duff M.N. Hughes and K.J. Rutt, Chem. Soc. (1969) 2126.