USE OF HYDROQUINONE AS CORROSION INHIBITOR FOR CARBON STEEL IN ACETIC ACID / SODIUM ACETATE BUFFER SOLUTION

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Abstract

The present paper reports the results obtained in the research of the inhibitory effect of hydroquinone (HQ) on the corrosion of OLC 52 carbon steel in acetic acid 0.25 mol L^{-1}/sodium acetate 1 mol L^{-1} buffer solution. The electrochemical stability of hydroquinone in the aggressive medium was analysed by cyclic voltammetry on platinum electrode within the potential window limited byhydrogen evolution reaction as cathodic limit and oxygen evolution reaction as anodic limit. Based on the potentiodynamic polarization curves (Figure 1), the surface coverage and inhibition efficiency have been determined (Table 1).

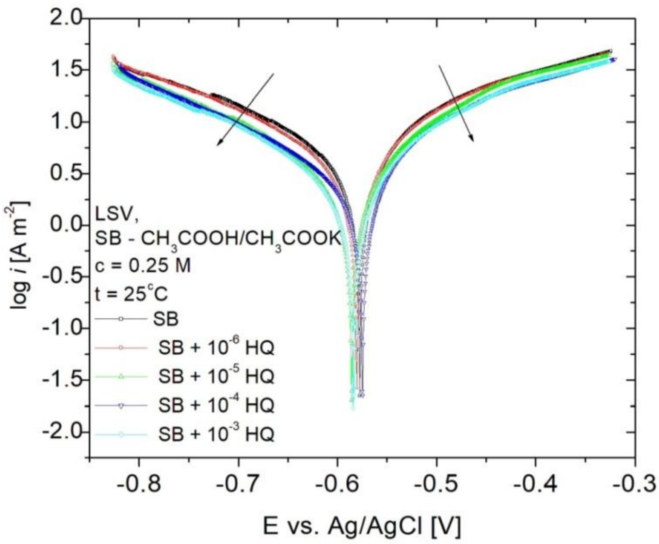

Fig. 1. Potentiodynamic polarization curves on Pt electrode in CH_3COOH 0.25 mol L^{-1} / CH_3COOH 1 mol L^{-1}.

Table 1. Electrochemical parameters obtained by potentiodynamic polarization.

T [K]	Electrode	c_{HQ}	E_{corr} [mV]	i_{corr} [μA/cm^2]	βa	βc	V_{corr} [mm/y]	IE [%]
25	OLC52	0	-577.8	535.4	234	294	6.24	0.00
		1.00E-06	-581.8	330.3	152	216.7	3.84	38.30
		1.00E-05	-586.8	285.4	171	215	3.32	46.70
		1.00E-04	-575.0	239.6	138.8	209.3	2.79	55.24
		1.00E-03	-582.6	138.9	101.2	135.5	1.62	74.06

Molecular modeling have been employed to obtain the molecular descriptors of hydroquinone (Table 2), which provide information about its inhibitory capability.

Table 2.

E_{HOMO}	E_{LUMO}	ΔE[eV]	μ[Debye]	χ[eV]	η[eV]	σ [eV^{-1}]	V [Å^3]	S [Å^2]	V/S [Å]
-7.02	-1.34	5.68	2.258	2.84	4.18	0.239	375	231	1.62

Based on the results presented, it can be appreciated that hydroquinone has an appreciable anticorrosive effect for OLC 52 even at low concentrations of 10^{-3} mol L^{-1}.

References:

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