CORROSION INHIBITION OF STAINLESS AND CARBON STEELS BY QUERCETIN IN ALCOHOLIC SOLUTIONS

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Abstract

Quercetin (QUE) is a flavone derivative, its rational name being 3,5,7-trihydroxy-2-(3,4-dihydroxy-phenyl)-4-chromenone. In pure state, it is a yellow solid, slightly soluble in water, but soluble in alcohol and alkaline solutions [1,2]. It is found in many plants such as citrus fruits, apples, onions, parsley, sage, tea and red grapes [1]. QUE has inhibitory potential due to the presence of oxygen heteroatoms in the molecule, as well as a number of 8 pairs of π electrons. The molecular parameters relevant to the inhibitory properties of QUE were determined by Zhixiong Xu et al. [3].

In this paper, the results obtained by the potentiodynamic polarization (PDP) method in the study of the inhibitory efficiency of QUE for stainless steel AISI 304L and carbon steel OLC 45 in 12% aqueous alcoholic solution are presented (table 1). The authors have took into account the fact that the mentioned metals are used in the food industry where they come into contact with such solutions.

Table 1. Electrochemical parameters and inhibitory efficiency η_{inh} obtained by PDP.

QUE conc. [mol L^{-1}]	304L			OLC 45		
	E_{corr} [mV]	i_{cor} [μA cm^{-2}]	η_{inh} [%]	E_{corr} [mV]	i_{cor} [μA cm^{-2}]	η_{inh} [%]
SB	-151	0.271	-	-676	15.9	-
10^{-6}	-144	0.226	16.6	-670	13.0	18,2
10^{-5}	-134	0.186	31,4	-665	11.1	30.2
10^{-4}	-106	0.153	43.5	-660	7.86	50.6
10^{-3}	-75.7	0.106	60.9	-656	5,25	67.0

The results obtained by PDP have been validated by electrochemical impedance spectroscopy. The nature of the metal - QUE interactions was evaluated based on the values of the Gibbs energy of adsorption ΔG^{o}_{ads}, determined using the adsorption constants K_{ads} assessed from the adsorption isotherms. The obtained results near -40 kJ mol^{-1} demonstrate the strength of the metal - inhibitor interactions, which are chemical in nature.

References

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