



EFFECT OF SOME NEW ORGANIC POLYMERS AS GREEN CORROSION INHIBITORS FOR BRASS IN COOLING WATER SYSTEM

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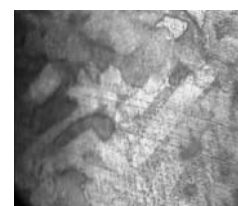
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Pure metals and alloys react chemically/electrochemically with corrosive medium to form a stable compound, in which the loss of metal occurs. The compound so formed is called corrosion product and metal surface becomes corroded. Among the several methods of corrosion control and prevention, the use of organic corrosion inhibitors is very well known.

Using the microwaves energy new organic polymers were synthesized by radicalic polymerization. These new organic compounds have anticorrosive and antiscaling properties and for this reason, were used for cooling water systems protection. The inhibition activity analysis of these new organic polymers was made by assuming that the mechanism of inhibition by organic molecules is chemisorptions and that the energetic of the corrosion process per se is unaffected by the addition of substituents on the parent compound. We presume that these new organic polymers inhibit corrosion of carbon steel by a protective mechanism, forming insoluble iron complexes and repairing the porous oxide layers. The methods employed were potentiodynamic polarization, electrochemical impedance spectroscopy, scanning electron microscopy (SEM) and metallurgical microscopy techniques. The addition of the organic inhibitors led in all the cases to inhibition of the corrosion process. The inhibition efficiency was high in all the studied cases. The corrosion parameters obtained from polarization curves and from EIS spectra are in good concordance and point out the inhibitory action of these new organic polymers. The adsorptions of the organic compounds on the carbon steels surface obeyed Langmuir's isotherm. Further characterization using Fourier transform infrared spectroscopy (FT-IR) demonstrates the adsorption of organic inhibitors and the formation of corrosion products on the carbon steels and the brass surface.

The inhibition process was attributed to the formation of the adsorbed film on the metal surface that protects the metal against corrosive agents. The EIS measurements have confirmed this protection and pointed out the formation of adsorption layers on the electrode surface.



INTRODUCTION

Copper and its alloys (brass), because of their excellent resistance to corrosion in neutral aggressive media and their ease of processing, are widely used in many industrial environments. Brass is a copper base alloy (Cu-Zn) that has wide range of applications due to its outstanding properties. That alloy has a long history of service, in marine environments and saline water systems,

heat exchangers, water distribution systems, water treatment units, multi-stage flash in the desalination plants. These applications can be ascribed to the attractive combination of properties these alloys possess, good machinability, high thermal and electrical conductivity and resistance to corrosion. Copper and brass are resistant toward the influence of atmosphere and many chemicals; however, it is known that these materials are susceptible to corrosion in aggressive media.

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Among the several methods of corrosion control and prevention, the use of organic corrosion inhibitors is very well known. This method remains one of the necessary procedures used to protect metals and alloys against attack in many industrial environments.¹⁻⁹

Brass materials are relatively noble for which brass possesses attractive properties, namely, good corrosion resistance, high thermal and electrical conductivity and better resistance to biofouling. It has been widely used in water distribution systems, water treatment units, condensers, desalination, power plant condensers and petrochemical heat exchangers, shipboard condensers, and many other applications.¹⁻⁸ Brass with 65% Cu and 35% Zn is prone to corrosion attack when exposed to a corrosive media because of the brass α -phase. Increasing the zinc content in the alloy changes the α -phase to β -phase and accelerates corrosion damage.¹ Dezincification of brass is one of the well-known and common processes by means of which brass loses its valuable physical and mechanical properties leading to failure of structure.^{1,9-13} Therefore, the corrosion mechanism and corrosion prevention of brass in different corrosive media have attracted many investigators.¹⁰⁻¹⁵ Several researchers have investigated brass in view of resistance to corrosion. Many techniques are used to improve the corrosion resistance of the brass used as mechanical parts in industry.

Corrosion is a major problem in cooling water industrial systems, in oil and gas production systems. Metal corrosion in water-conveying systems such as cooling water circuits is of major concern in industrial applications. It is well known that in all the cases of cooling water systems at the metal/water interface contact appear frequent corrosion processes which determine deposition of corrosion products, like scales. Due to the scales formation the heat exchange becomes more difficult, disturbing the normal function of industrial installation. In this regard, aspects like cost of treatment versus cost of corrosion damages as well as process safety and the impact of corrosion and corrosion treatment on the environment have to be taken into account. It is well known that excessive corrosion does not only lead to serious damage of installations, but it also causes considerable environmental pollution. Most previous research into their usage has concentrated on relationships between chemical structure and inhibition performance.¹⁻⁷ Recent investigations have additionally emphasized the importance of the nature of the metal surface in inhibition

performance.¹ The ability of an inhibitor to provide corrosion protection therefore depends to a large extent upon the interaction between the inhibitor and the metal surface under corrosion conditions. Generally, it is assumed that strong adsorption of the inhibitors is a prerequisite. The adsorption of inhibitors leads to the formation of a physical barrier that reduces the metal reactivity in the electrochemical reaction of corrosion.² Early studies considered the adsorption of inhibitors on metal surfaces to be primarily physical adsorption and/or chemisorptions.^{3-6,9-11} New investigations have shown that adsorption could also occur through hydrogen bonding.^{1,7,8} Most of these studies made use of sensitive surface analysis tools such as X-ray photoelectron spectroscopy (XPS) to resolve the nature of inhibitor adsorption.¹³⁻¹⁷ Some earlier works has however been carried out under conditions that are not representative of on actual application. In this paper, the inhibition of brass corrosion in cooling waters by organic compounds was investigated by potentiodynamic polarizations, EIS measurements and metallography analysis.¹⁷⁻²² Electrochemical measurements are used to assess the relevant physical properties of new corrosion inhibitors. This paper presents some attempts of analyzing of corrosive phenomena, which occur in cooling water systems, and relates to the protection of metallic surfaces from corrosion using these new polymers obtained in microwaves field.

EXPERIMENTAL

The inhibitory action was studied through tracing the polarization curves obtained using the, potentiodynamic method calculation of the kinetic parameters of corrosion in case of solutions with inhibitors, especially the corrosion current densities, and their comparison with the kinetic parameters of the solution without inhibitors. The polarization curves were obtained by potentiostatic and potentiodynamic methods. In all experiments the electrochemical polarizations were started about 30 minutes after the working electrode was immersed in solution, to allow the stabilization of the stationary potential. The working electrode potential was always measured with reference to the saturated calomel electrode (SCE) and was plotted against current from external circuit, obtaining the anodic or cathodic curves according to the variation of the working electrode potential. In order to reduce the ohmic resistance, we used a single compartment cell in which the working electrode was situated in the cell center and surrounded by the auxiliary electrode made of bright platinum gauze. The studied material was the brass. The used organic inhibitor were two polymers namely PASAC-10 (polyaspartic acid and H_3PO_4 molar ratio 1:0.025 in propylene carbonate with sodium citrate at $t=200^\circ C$) and PASAC-12 (polyaspartic acid 0.07M and H_3PO_4 , in ethylene carbonate/propylene carbonate, gravimetric ratio 1/1 at $t=150^\circ C$) which were obtained by radicalic polymerization in presence of microwave field from.

Tabel 1

The chemical composition of the working electrode

Electrode	Fe%	Cu%	Zn%	Si%	Pb%
Brass	0.29	65.60	34	0.060	0.059

Table 2

The chemical composition of the cooling water type SC₁

Indicators	UM	Water type SC ₁ , values of parameters
pH		8.42
Conductivity	μs/cm	1061
Alcalinity p	mval/L	0.1
Alcalinity m	mval/L	3.3
Total Hardness	mval/L	8.3
Calciu Hardness	mval/L	3.0
Chloride, Cl ⁻	mg/L	117.01
Sulfate	mg/L	155
Solid substances	mg/L	2.75
Organic compounds	mg/L	11.37
Iron	mg/L	0.073
Aluminium,	mg/L	0.0175
Nitrite, NO ₂ ⁻	mg/L	<0.1
Nitrate, NO ₃ ⁻	mg/L	10
Phosphate, PO ₄ ³⁻	mg/L	0.046
Copper, Cu ²⁺	mg/L	<0.015
Zinc, Zn ²⁺	mg/L	<0.1

The working electrode was made from these metal materials and had a cylindrical shape. This shape is preferred, because it assures a greater surface and a reduce number of edges. Prior to each determination, the working electrode was mechanically ground and polished with emery paper of varied granulation up to mirror-luster, degreased in benzene at boiling temperature in order to remove all traced of fat and remained abrasive powder on the electrode surface after polishing. After that, the working electrode was washed with distilled water and inserted in the polarization cell, which was the usually three-electrode cell. All tests have been performed at 25°C under atmospheric oxygen without agitation. The electrochemical measurements were made using an automated model VoltaLab 40 potentiostat/galvanostat. Surface analysis on the brass electrode of the formed adsorbed film was accomplished by both FT-IR (FT-IR spectrometer Bruker optik) and metallographic micrographies (Hund H660). The corrosion medium was industrial cooling water type S with the following chemical composition:

RESULTS AND DISCUSSION

The treatment of the corrosive media can be achieved by removing the aggressive chemical agents or by using inhibitors, which control the corrosion of anodic or cathodic reaction of both. Here, the inhibition of the corrosion is the result of the adsorption of the organic compound on the metal surface forming an invisible film of a few molecular diameters thickness. The inhibition activity analysis of the organic compound was made by assuming that the mechanism of inhibition by organic molecules is chemisorption

The polarization behaviour of brass mentioned above was studied through the plotting of the polarization curves obtained using the potentiodynamic method, finding the kinetic parameters of corrosion (especially the density of the corrosion current) from solutions without inhibitors and their comparison with the kinetic parameters from solutions with different concentrations of inhibitor. The corresponding Tafel parameters were obtained by Mansfeld's method, employing polarization data near the corrosion potential. In the present paper, when values of $E - E_{cor}$ are higher than about 70 mV, slight but significant changes in the anodic and cathodic Tafel slopes were found. Fig. 2 show a series of potentiodynamic polarization curves of brass electrode in industrial cooling water type SC₁ (it was not aerated) in absence and presence of different concentrations of PASAC-10/12.

The OCP curves of the brass electrode in cooling water systems in presence and absence of Xppm inhibitors are shown in Fig. 1. It can be seen from Fig. 1 that the aggressive ions of the solutions increased the potential to the more negative values in the first few minutes perhaps due to the dissolution of cooper from brass. For all electrodes, the open-circuit potentials drift with time in all active direction and tend to stabilize within 50 min. The presence of Xppm PASAC10 and PASAC12 abruptly shifts the OCP to less

negative values from the first moment of brass immersion. This results from the adsorption of inhibitor molecules onto the brass surface preventing to formation of oxo-cuprous complexes and blocking the active sites on the brass surface. During the first 70 min of immersion the OCP becomes substantially less negative attaining a value of -150mV as a result of the stabilization of the PASAC10 / PASAC12 film on the brass surface.

The potentiodynamic polarization curves of the brass electrode in cooling water system S1 with and without inhibitors are shown in Fig. 2. Fig. 2 depicts the anodic and cathodic polarization curves recorded on brass in S1 with and without inhibitors at 25°C. Both anodic and cathodic curves were polarized in comparison with that obtained in the absence of inhibitor, thus inhibiting both the anodic dissolution of copper and the reduction of hydrogen ions on the electrode surface.

Analysis of the polarization curves from Fig. 2 indicates that at low overvoltages, the Tafel

relationship are followed, showing that both anodic and cathodic reactions are activation-controlled. At higher overvoltages a limiting current appears on the anodic and cathodic polarization curves showing that the transport of ions towards the electrode surface becomes the rate-determining step (concentration polarization). Analyzing the cathodic polarization curves from Fig. 2 it can be observed that on the large range of the potential the brass electrodes behave very close to a passive behaviour. Practically, we can say that in this potential range the electrode surface is passivated. We consider that, in this potential range, the cathodic reaction is hindered by the oxide film (passive film) from the electrode surface. In this potential range takes place the oxygen reduction cathodic reaction according to equation:

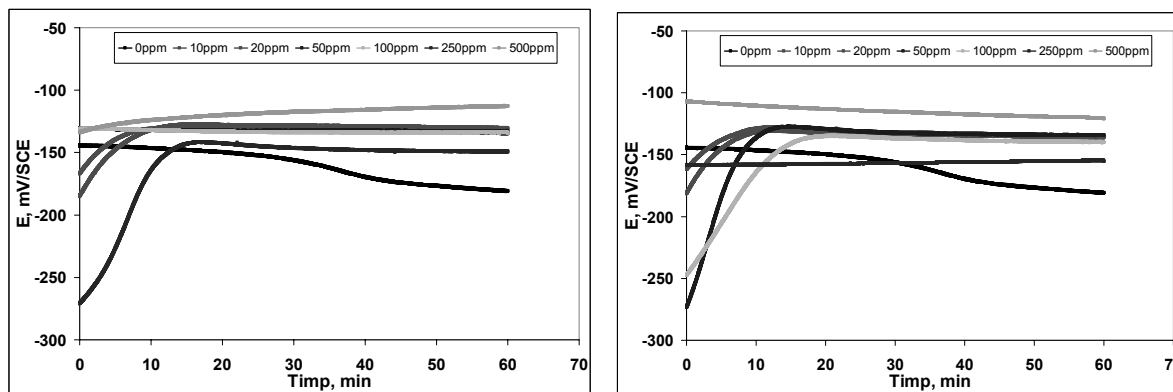
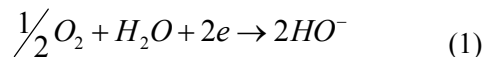


Fig. 1 – Open-circuit potential versus time for brass in cooling water systems +Xppm PASAC-10 and PASAC-12 at temperature of 25°C.

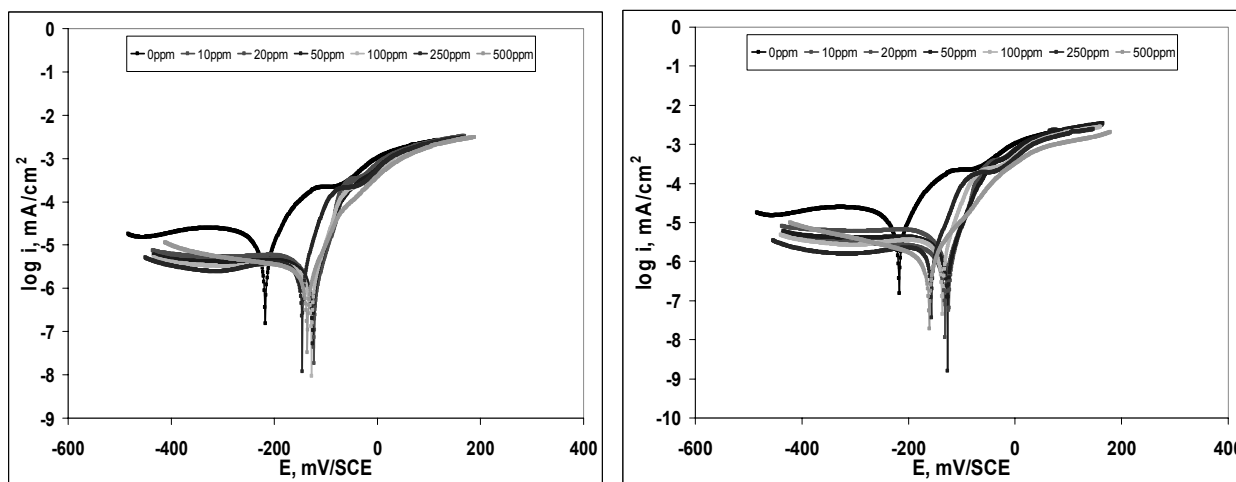


Fig. 2 – Polarization curves of brass in cooling water SC₁ +Xppm PASAC-10 and PASAC-12 at temperature of 25°C.

Table 3

Kinetic corrosion parameters of brass in cooling industrial water type SC₁ in presence and absence of organic inhibitor type PASAC-10 at temperature of 25°C

Inhibitor) (ppm)	i_{corr} , $\mu\text{A}/\text{cm}^2$	R_p , $\text{k}\Omega \cdot \text{cm}^2$	E (%)	E_{corr} , mV/SCE	b_a , mV/dec	b_c , mV/dec	P $\mu\text{m}/\text{an}$	Rmpy	Kg ($\text{g}/\text{m}^2\text{h}$)	θ
0	4.27	1.87	-	-217.3	40.3	-56	45.19	1.934	0.049	-
10	0.81	7.47	81	-122.9	24.7	-45.8	9.46	0.402	0.0097	0.81
20	0.85	8.26	80	-123.6	27.4	-54.3	9.86	0.384	0.0098	0.80
50	1	7.14	77	-128.1	27	-64.3	11.64	0.453	0.051	0.77
100	1.2	6.48	72	-125.7	27.9	-70.2	13.94	0.543	0.014	0.72
250	1.88	4.59	56	-146	26.4	-107.3	21.86	0.851	0.022	0.56
500	1.16	7.26	73	-135.7	38.2	-79	13.46	0.525	0.013	0.73

Table 4

Kinetic corrosion parameters of brass in cooling industrial water type SC₁ in presence and absence of organic inhibitor type PASAC-12 at temperature of 25°C

Inhibitor) (ppm)	I_{corr} , $\mu\text{A}/\text{cm}^2$	R_p , $\text{k}\Omega \cdot \text{cm}^2$	E (%)	E_{corr} , mV/SCE	b_a , mV/dec	b_c , mV/dec	P $\mu\text{m}/\text{an}$	Rmpy	Kg ($\text{g}/\text{m}^2\text{h}$)	θ
0	4.27	1.87	-	-217.3	40.3	-56	49.52	1.934	0.049	-
10	0.75	11.4	82	-131.9	30.4	-79.2	8.8	0.339	0.0087	0.82
20	0.92	8.03	78.5	-124.5	28.8	-58.6	10.55	0.416	0.0106	0.78
50	1	7.59	77	-127	27.9	-54.5	11.62	0.452	0.011	0.77
100	0.9	7.09	79	-136.3	27.3	-63.4	10.48	0.407	0.0104	0.79
250	1.48	6.03	65	-157.1	27.4	-99.7	17.15	0.67	0.0171	0.65
500	1.04	13.8	67	-161.2	68.6	-122.3	16.42	0.638	0.0163	0.67

From polarization curves obtained by potentiodynamic method were calculated all kinetic corrosion parameters which are given in Tables 3, 4. This confirms that these inhibitors behave as a mixed inhibitor. The electrochemical parameters derived from the polarization curves at different concentrations are given in Tables 3, 4.

Analyzing these tables, it can be observed that the addition of the organic inhibitor to the amounts shown in Tables 3, 4 leads in all the cases to inhibition of the corrosion process. This fact can be explained taking into account the effects of organic compounds on the electrochemical properties of the brass. It can be observed from Tables 3, 4 that, the inhibitor PASAC12 has a higher efficiency for corrosion system brass+S1 than for PASAC10 in same condition. Analyzing in comparison the corrosion rate of organic inhibitors, in the same condition, one can see that the PSAC-12 had a higher efficiency for corrosion system brass in S1 and PASAC10 had a good efficiency for same system. Sometimes on the anodic curves appear oxidation peaks followed by the narrow passive range and a decrease of the current density (this behaviour can be explained due to formation of oxo-hydroxo-complexes of Cu). The maximum

efficiency is obtained at the inhibitor concentration for PASAC 12 is 100ppm, for PASAC10 is 20ppm. At the increasing inhibitor concentration over these concentrations (200 ppm) the inhibitor efficiency starts to decrease, respectively the corrosion current densities begin to increase again.

The variation curves of the corrosion current density and efficiency function of the inhibitor concentration are presented in Fig. 3. From figures, one can see much better the influence of these parameters on the polarization behaviour of the brass in cooling water system.

We presume that the higher inhibitor efficiency is a consequence of the adsorption process. To quantify the effect of inhibitor concentration on the corrosion rate, it is common to fit the rate data to equilibrium adsorption expressions, such as Langmuir equation: $\theta / (1 - \theta) = KC$, where θ is the fraction of surface coverage by the inhibitor and K is the equilibrium constant for the adsorption reaction. θ is given by: $\theta = (i_{\text{corr}} - i_{\text{inh}}) / i_{\text{corr}}$, where i_{inh} and i_{corr} are the corrosion rates in industrial cooling water S1 with and without inhibitor. Usage of the Langmuir treatment is often justified with the argument that inhibition must involve adsorption.

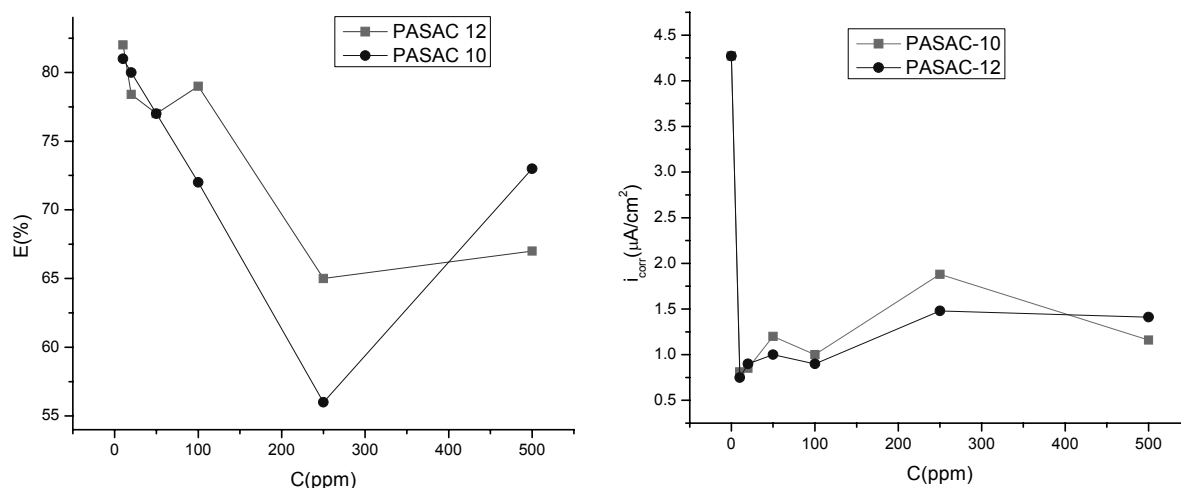


Fig. 3 – The influence of the inhibitors PASAC10 and PASAC12 concentration on the corrosion rate and efficiency of the brass in cooling water type SC at 25°C.

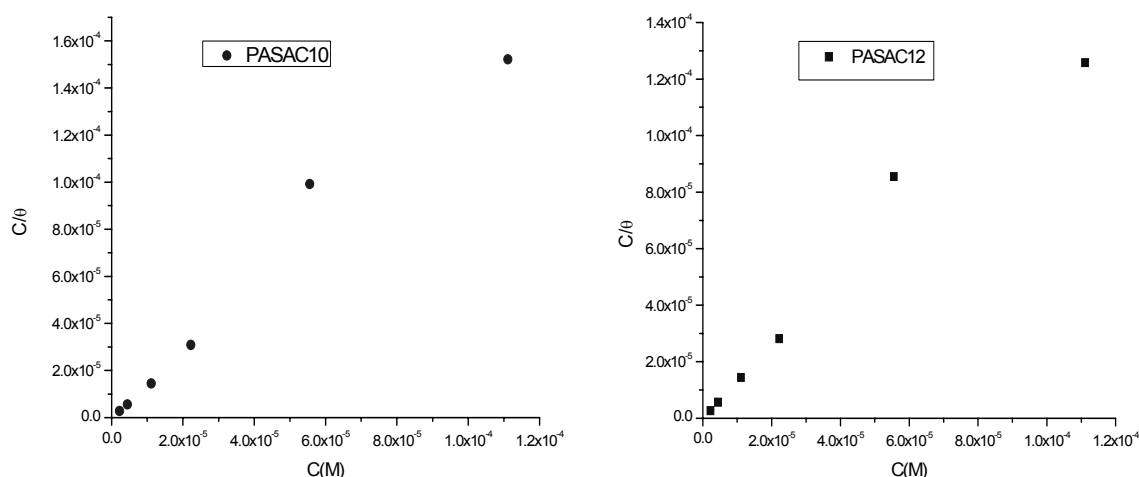


Fig. 4 – Langmuir plot for a) PASAC 10 and b) PASAC 12 on brass in S1 at different inhibitor concentrations.

In this study, the Langmuir isotherm is plotted against C , when a linear relationship is obtained for each inhibitor and a slope of near unity for each compound indicated approximate Langmuir behaviour (see Fig. 4). Further, we shall try to show what type of adsorption process takes place on the electrode surface.

The adsorption equilibrium constant (K_{ads}) is related to the standard free energy of reaction (ΔG_{ads}^o) by the equation:

$$\ln K_{ads} = -(\Delta G_{ads}^o / RT).$$

The obtained values ΔG_{ads}^o up to -20KJmol^{-1} are consistent with electrostatic interaction between the charged molecules (in our case, the inhibitor molecules) and the charged electrode surface (physical adsorption), while those more negative than -40KJmol^{-1} involve charge sharing or transfer

from the inhibitor molecules to the metal surface to form a co-coordinative type of bond (chemisorptions see Table 5).¹⁸⁻³⁰

The corrosion of brass in cooling water system in the absence and presence of PASAC-10 and PASAC-12 were investigated by EIS. Impedance measurements were performed at open circuit potential on the frequency range between 100 kHz and 40 mHz with an AC wave of ± 10 mV (peak-to-peak) and the impedance data were obtained at a rate of 10 points per decade change in frequency.

Nyquist plots for brass obtained at the interface in the presence of inhibitors at optimum concentration are given in Figs. 5-7. All impedance spectra exhibit one capacitive loop and the diameter of the semicircles increases on increasing the inhibitor concentration suggesting that the formed inhibitive film was strengthened by the

addition of inhibitors. However, these diagrams are not perfect semicircles and this fact is attributed to frequency dispersion. The semicircular appearance shows that the corrosion of steel is controlled by charge transfer and the presence of inhibitor does not change the mechanism of dissolution.

Figs. 5-7 also indicates that the diameters of the capacitance loops in the presence of 20ppm PASAC10+Brass-SC1, 50ppm and 100ppm PASAC10+Brass-SC1 and for 100ppm PASAC12+Brass-SC1 are bigger than those in the absence of organic inhibitors, suggesting good anticorrosion performance on the brass in SC1.

Table 5

The values of K_{ads} and ΔG_{ads}° for studied systems

The system	Type of material	Values of K_{ads} , M^{-1}	Values of ΔG_{ads}° , KJM^{-1}	Type of adsorption
Cooling water type SC ₁ +PASAC-10	Brass	6.1554×10^5	-32.457	Chemisorption and Physical adsorption
Cooling water SC ₁ +PASAC-12	Brass	8.651×10^5	-33.850	Chemisorption and Physical adsorption

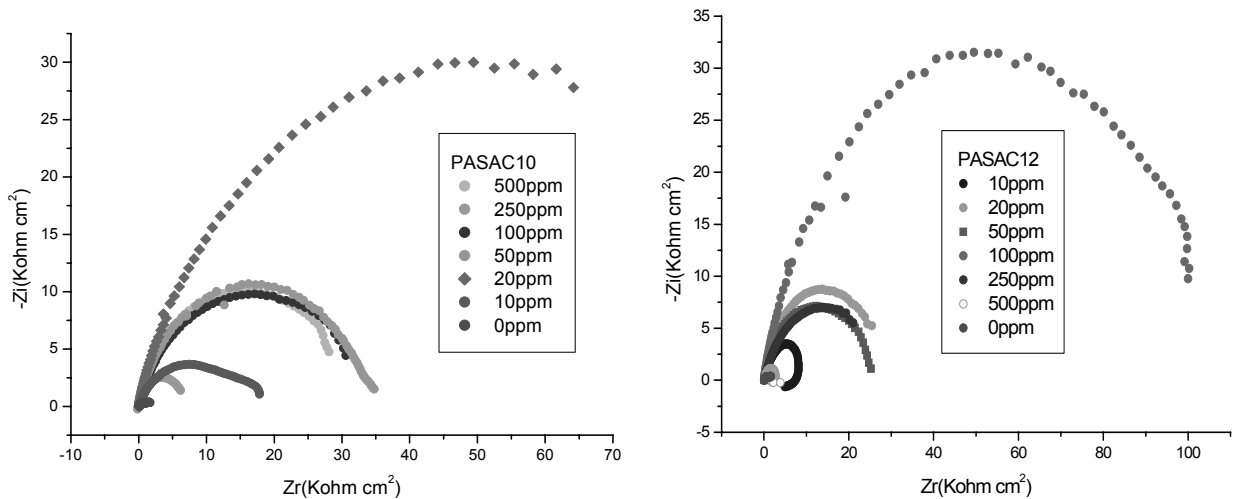


Fig. 5 – The Nyquist plot for brass in SC1 with and without organic inhibitor.

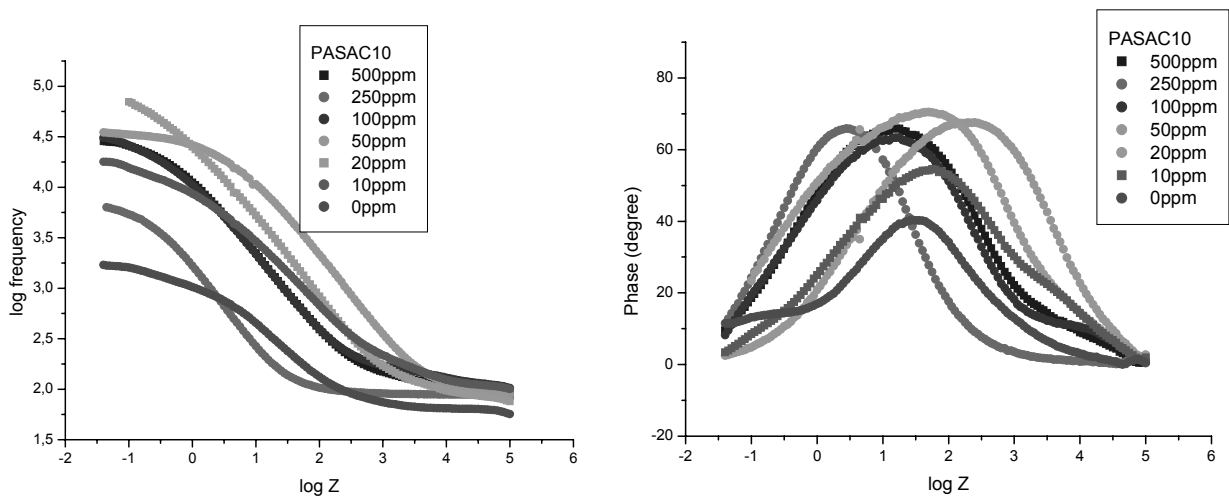


Fig. 6 – The Bode plot for brass in SC1 with and without organic inhibitor PASAC-10.

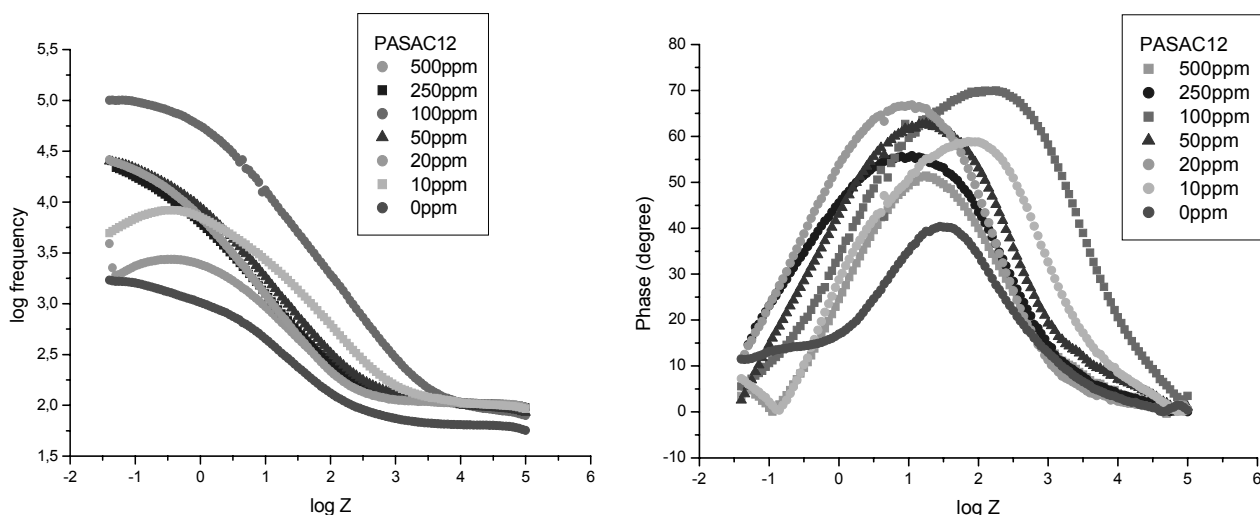


Fig. 7 – The Bode plot for brass in SC1 with and without organic inhibitor PASAC-12.

Bode diagrams presented in Figs. 5-7 are in accordance with Nyquist diagrams. It can be observed that in absence of organic inhibitor the electrode presents one time constant corresponding to a phase angle of about 35° at medium and low frequencies, this fact indicates an inductive behaviour with low diffusive tendency. On the contrary, in the presence of the organic inhibitor, on the curve-phase angle versus log frequency appears a maximum very well defined corresponding to a phase angle of about 75° which means that in this case the electrode has a strong capacitive behaviour, according with the results obtained by electrochemical polarization and in concordance with the Nyquist diagrams.

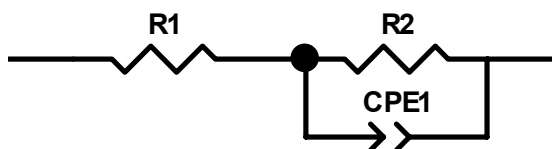


Fig. 8 – Equivalent circuit.

All the obtained plots show only one semicircle and they were fitted using one time constant equivalent mode with capacitance (C), the charge transfer resistance (R_{ct}) and R_s solution resistance. The lower capacitance values for systems: SC1+Brass with PASAC-10 and PASAC-12, indicate the inhomogeneity of the metal surface roughened due to corrosion. The C_{dl} values decreases with the increasing of the inhibitor concentration and reaches very low values for the optimum concentrations of inhibitors for all the studied systems indicating the reduction of charges accumulated in the double layer due to the formation of adsorbed inhibitor layer.

In this paper, FT-IR spectrometry was used to identify whether there was adsorption and to provide new bonding information on the brass surface after immersion in the cooling water system containing organic inhibitors.²³⁻²⁸ All spectra in these experiments were obtained at a resolution 4 cm^{-1} in the region $4000\text{-}650\text{ cm}^{-1}$.

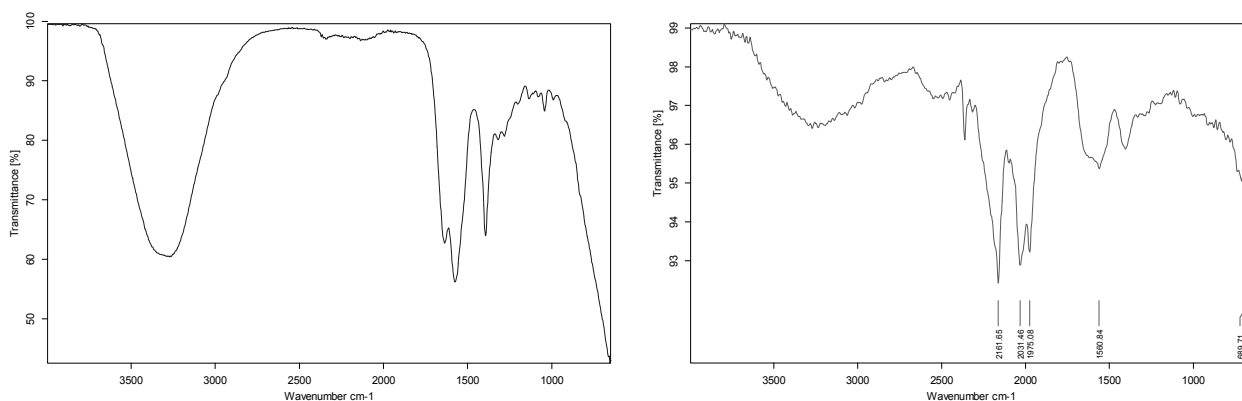


Fig. 9 – FT-IR spectra of (a) PASAC10 and (b) Brass+20 ppm PASAC10+S1.

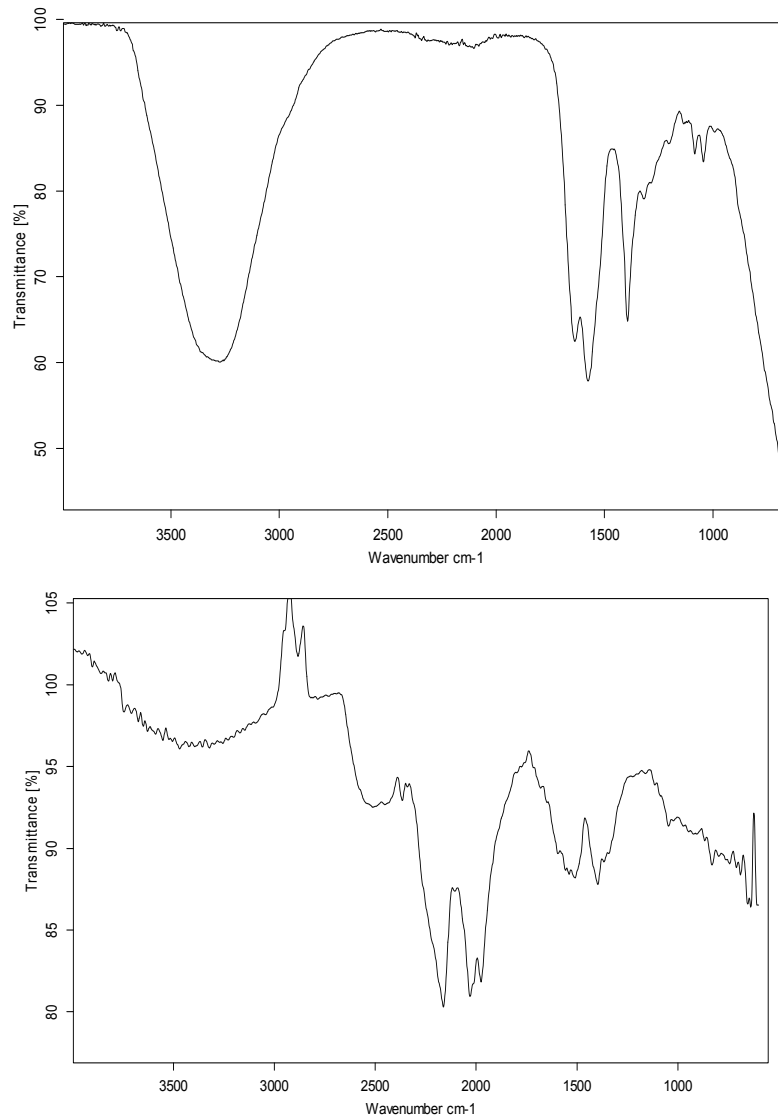


Fig. 10 – FT-IR spectra of (a) PASAC12 and (b) Brass+100 ppm PASAC12+S1.

The FT-IR spectrum of organic polymer PASAC10 and brass immersed in cooling water S1 containing 20ppm PASAC10 is shown in Fig. 9a and 9b. The FT-IR spectra of adsorbed protective layer formed on the surface after immersion in S1 containing optimum concentration of inhibitor 20ppm PASAC10 is shown in Fig. 9b. As can be seen all important peaks in pure compounds appeared in adsorption layer on the electrode surface. The band around 3250 cm^{-1} is attributed to O-H stretching, which indicates that the protective film contains H_2O . The peak around 2878 cm^{-1} are assigned to C-H stretching vibration, the peaks at 1560 and 1423 cm^{-1} corresponds to the C=O and N-H. The presence of C-N, C-O is indicated by their stretching modes at 1078 and 789 cm^{-1} . This is already confirmed from the Langmuir adsorption isotherm studies.

The FT-IR spectrum of pure organic polymer PASAC 12 is depicted in Fig. 10a and the FT-IR spectrum obtained for the brass immersed in cooling water systems type S1 containing 100ppm PASAC12 inhibitor organic is presented in Fig. 10b. A broad peak at 3150 cm^{-1} indicates the presence of the C-H bond of the PASAC12 and the presence of C=O, N-H, C-H is indicated by their stretching modes at region $1602, 1541, 1315$ to 1200 cm^{-1} respectively. The FT-IR spectra obtained for the brass immersed in cooling water systems type S1 containing 100ppm PASAC12 inhibitor organic is presented in Fig. 10b. A broad band in the range from 3050 cm^{-1} is attributed to C-H, the appearance of the peak in region 1509 cm^{-1} is assigned to N-H symmetric stretching vibration. The peaks for C-N stretching modes can be assigned in the region around 1490 cm^{-1} . The bands 1200 cm^{-1} and 1100 cm^{-1} are attributed to C-O and C-N.

In Fig. 11 are given a few micrographies obtained by us for the following systems: brass +S1 before and after a certain immersion in cooling water type S1 with and without organic inhibitor. Analyzing in comparison Figs. 11b, 11c, 11d and 11e-g, it can be observed that on the surface of micrographies there are the adsorbed films of inhibitor and corrosion products and that these films are thicker if the inhibitor concentration are higher. These films behave like a barrier between corrosive medium and metal surface and as a consequence the corrosion

process is inhibited – see in comparison the Figs. 11 (a, b, c, d, e, g and h).^{29,30}

Analyzing in comparison Fig. 11 (a-h), it can be observed that the corrosive attack is much more accentuated in the case of brass + water type S1 system than in the case of brass + water type S1 +Xppm inhibitor system. This finding is in good concordance with the results obtained by electrochemical method – see Tables 3, 4 and the polarization curves from Fig. 2.

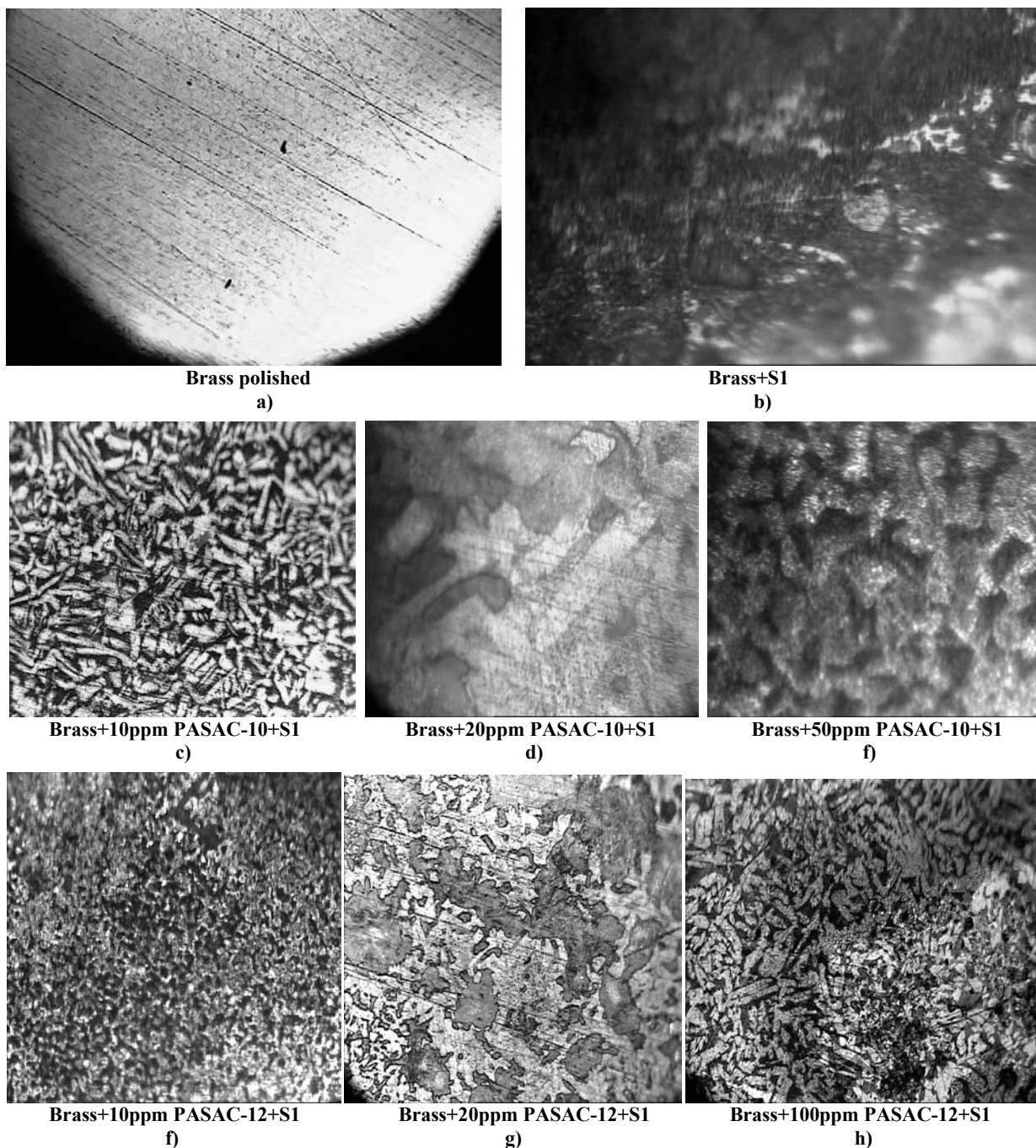


Fig. 11 – Micrographies of the brass in cooling water type S1 with and without organic inhibitor PASAC-10 and PASAC-12.

CONCLUSIONS

In the studied corrosion systems at low overvoltages, the corrosion process is under activation control, while at high overvoltages is controlled by diffusion.

The addition of organic inhibitors led in all the cases to the inhibition of the corrosion process.

The new organic polymers which were obtained by us have presented a good inhibitory action and a significant efficiency for decreasing of the rate corrosion.

The organic inhibitors were adsorbed on the brass surface according to a Langmuir isotherm. The values of the adsorption constant determined from the plot of Langmuir isotherm pointed out that, in these cases there is a mixture of physical and chemical adsorption of organic inhibitors.

The adsorption of all organic inhibitors investigated follows the Langmuir isotherm and the FT-IR, results also reveals the adsorption of inhibitor molecule on the electrode surface and blocking the active sites.

PASAC10 and PASAC12 inhibit both anodic and cathodic reactions by adsorption on the brass surface and hence behave like mixed type inhibitor.

In all of the cases, the organic inhibitor type PASAC-12 had a higher efficiency; PASAC-10 had a good efficiency.

The inhibition efficiency follows the order: PASAC12>PASAC10.

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