The Effect of the Specific Magnetic Susceptibility of the 06ХН28МТД Alloy (Similar to AISI 904L Steel) on Its Corrosion Behaviour in the Circulating Water of Enterprises

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The article investigates the effect of the specific magnetic susceptibility χ_0 of 06ХН28МДТ alloy (similar to AISI 904L steel) on its corrosion behaviour in recycled water of enterprises, which most often has a pH of 4–8 and a chloride concentration of up to 600 mg/l. Under such conditions, heat exchangers made of this alloy melt can be subject to pitting. Their resistance to pitting corrosion is estimated by means of the critical temperatures (CPT) in model-recycled water with the following parameters. In particular, it has been found that the chlorides' concentration within them has a more intense effect on the alloy CPT than their pH, since it increases up to 8°C with an increase in pH from 4 up to 8 and up to 11°C with a decrease in chlorides' concentration from 600 down to 350 mg/l. It is found that, in the model recycled water with pH 4 and chlorides' concentration of 350 mg/l, the CPT of the alloy decreases from 53°C down to 46°C, and with chlorides' concentration of 600 mg/l from

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42°C down to 38°C with an increase in its parameter χ_0 from 2.86 m³/kg up to 3.09 m³/kg. However, its further increase up to 3.38 m³/kg contributes to the elevation of the CPT up to 49°C in media with pH 4 and 350 mg/l and up to 40°C with pH 4 and 600 mg/l. This corrosion behaviour of the alloy is due to the synergistic effect of the alloy high χ_0, the maximum content of titanium nitrides and sulphides, and the characteristic features of the selective dissolution of ΔCr, ΔNi and ΔFe from pits. In particular, under such conditions, they are stable and develop steadfastly, since the coefficients of selective dissolution of Cr $Z_{Cr} < 1$ and Ni $Z_{Ni} > 1$.

Key words: resistance of 06ХН28МДТ alloy to pitting, specific magnetic susceptibility of 06ХН28МДТ alloy, selective dissolution of base metals from pits, chloride-containing recycled water.

У статті досліджено вплив питомої магнетної сприйнятливости χ_0 стопу 06ХН28МДТ (аналог криці AISI 904L) на його корозійну поведінку в оборотніх водах підприємств, які найчастіше мають pH 4−8 і концентрацію хлоридів до 600 мг/л. За таких умов теплообмінники з цього стопу можуть піддаватися піттінґуванню (точковій корозії). Їхній опір піттінґуванню оцінено за критичними температурами (КТП) в модельних оборотніх водах з такими параметрами. Зокрема, встановлено, що концентрація хлоридів у них інтенсивніше впливає на КТП стопу, ніж їхній показник pH, оскільки КТП зростає до 8°C зі збільшенням pH від 4 до 8 та до 11°C з пониженням концентрації хлоридів від 600 до 350 мг/л. З'ясовано, що в модельних оборотніх водах із pH 4 та концентрацією хлоридів у 350 мг/л КТП стопу понижується від 53°C до 46°C, а з 600 мг/л — від 42°C до 38°C зі збільшенням його параметра χ_0 від 2,86 м³/кг до 3,09 м³/кг. Але подальше його зростання до 3,38 м³/кг сприяє росту КТП до 49°C у середовищі з pH 4 і 350 мг/л та до 40°C — з pH 4 і 600 мг/л. Таку корозійну поведінку стопу зумовлено синергетичним впливом високого значення параметра χ_0 стопу, максимальним вмістом у ньому нітридів і сульфідів Титану та характерними особливостями селективного розчинення ΔCr, ΔNi і ΔFe із піттінґів (раковин на виливку). Зокрема, за таких умов вони є стабільними та розвиваються стабільно, оскільки коефіцієнти селективного розчинення Cr $Z_{Cr} < 1$, а Ni — $Z_{Ni} > 1$.

Ключові слова: опір стопу 06ХН28МДТ піттінґуванню, парамагнетна сприйнятливість стопу 06ХН28МДТ, селективне розчинення основних металів із піттінґів, хлоридовмісні оборотні води.

1. INTRODUCTION

Alloy 06ХН28МДТ (similar to AISI 904L steel) has high corrosion resistance in many aggressive media, in particular at temperatures up to 80°C in sulphuric acid of various concentrations, but it is subject to intercrystalline corrosion in 55% acetic and phosphoric acid. It is used to make castings of mining and metallurgical equipment parts, welded

construction of boilers, heat exchangers, pipelines, tanks, equipment for the production of complex mineral fertilisers, coils of tubular furnaces for ammonia, hydrogen, ethylene, carbon disulfide production plants, *etc.* [1, 2]. This alloy and its similars AISI 904L (USA), Z1NCDU 31-27-03 (France), SCS23 (Japan) are often used in the production of heat exchange elements for plate-like heat exchangers made of cold-rolled metal with a thickness of 0.3 to 1.0 mm, which are used in the production of sulphuric, hydrofluoric, orthophosphoric acid, *etc*. At the same time, recirculating systems with water are used to cool the process product in these industries. It is known [3−5] that, under such conditions of acid production, heat exchanger plates on the side of recycled water can be subjected to pitting and crevice corrosion under the influence of chloride ions present in it. Many scientific studies the evaluation and prediction of pitting corrosion resistance of heat exchangers made of AISI 321, 12X18H10T [6], AISI 304, 08X18H10 [7], AISI 316 [8], AISI904L, 06XH28МДТ have been devoted [9, 10]. They found that it mainly depends on the parameters of the chloride-containing media (pH, chloride concentration) and, to a lesser extent, on their structural heterogeneity and Cr content. At the same time, paper [11] established a correlation between the corrosion losses of AISI 304, AISI 321 steels and 06XH28МДТ alloy and their specific magnetic susceptibility, where the possibility of using this indicator to assess the pitting corrosion resistance of these construction materials in chloride-containing media has been considered. Therefore, the relationship between the critical pitting temperatures (CPT), corrosion losses of metals ΔCr, ΔFe, ΔNi from pits on the surface of 06XH28МДТ alloy in model recycled water and its specific magnetic susceptibility has been investigated.

2. EXPERIMENTAL/THEORETICAL DETAILS

Five industrial melts of 06XH28МДТ alloy have been studied. Their CPT, chemical composition (Table 1), and structural heterogeneity in [5, 9, 10] have been investigated.

The value of the specific magnetic susceptibility χ_0 in the saturation field has been determined experimentally using automated magnetometric equipment such as Faraday scales [11]. The values of χ_0 for five melts of 06XH28МДТ alloy obtained earlier in [12] are given in Table 2.

The critical pitting temperatures of the 06XH28МДТ alloy in model-recycled water with a pH of 4−8 and a chloride concentration from 350 mg/l up to 600 mg/l have been determined [9]. Such water parameters of recycling systems of enterprises are most often encountered during the operation of heat exchangers [4]. The corrosion losses of the main metals from stable pitting ΔCr, ΔNi, ΔFe using the methods of [13−15] in model recycled water with a pH of 4−8 and a chloride con-

TABLE 1. Chemical composition of 06XH28MДТ alloy (similar to AISI 904L steel).

Melt number	Content of alloying elements, % wt.									
	C	Si	Mn	Cr	Ni	Mo	Cu	Ti	S	P
1	0.050	0.60	0.32	24.31	27.39	2.90	2.75	0.79	0.006	0.029
2	0.067	0.57	0.46	22.68	27.65	2.78	2.68	0.59	0.005	0.027
3	0.068	0.55	0.54	21.84	27.45	2.55	2.60	0.55	0.004	0.038
4	0.048	0.62	0.57	22.67	27.73	2.56	2.53	0.67	0.006	0.028
5	0.050	0.57	0.31	23.46	27.51	2.51	2.78	0.89	0.004	0.032

centration 300 mg/l and 600 mg/l have been determined.

3. RESULTS AND DISCUSSION

The analysis of the dependencies between the CPT of 06XH28MДТ alloy and the pH of model recycled water showed that they increase with an increase in this indicator regardless of the chloride content (Fig. 1). In particular, it has been found that in model recycled waters with a chloride concentration of 600 mg/l, the CPT of melts Nos. 2 and 4 increases by 6°C with an increase in the pH of model-recycled waters from 4 up to 8. At the same time, the CPT of melts No. 6 in model recycled waters with pH 7, 8 and No. 2 with pH 4, 5 were the same (44°C and 42°C, respectively). This is most likely due to a decrease in the hydrogen ionisation overvoltage on Mo and Ti carbides in melt No. 2 in low acidic chloride-containing solutions and the 'inhibition' of the alloy's CTP increase with increasing pH, since it has a higher Mo and C content than No. 4 (Table 1).

And in melt No. 4, the probability of precipitation of Mo and Ti carbides from the austenite solid solution is very low, since it contains only 0.048% wt. of carbon (Table 1), which is less than its maximum solubility (0.05% wt. at room temperature [15]). At the same time, molybdenum and titanium carbides are characterised by a very low hydrogen overvoltage, which, under conditions of hydrogen depolarisation corrosion, accelerates cathodic reactions and shifts the corrosion potential of steel or alloy in the positive direction, increasing the speed

TABLE 2. Specific magnetic susceptibility of 06XH28MДТ alloy.

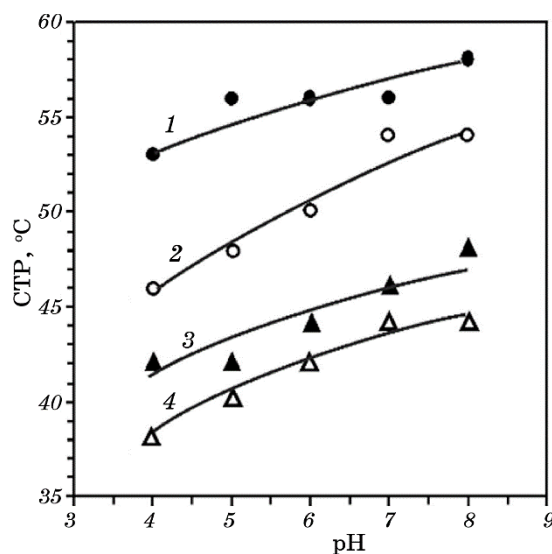| Melt number	1	2	3	4	5
χ_0, m³/kg	2.95	2.86	3.38	3.09	2.96

Fig. 1. Dependence of the CPT of 06XH28МДТ alloy (curves *1*, *3* are melt 2, curves *2*, *4* are melt 4) on the pH of model recycled water with a chloride concentration of 350 mg/l (curves *1* and *2*) and 600 mg/l (curves *3* and *4*).

of anodic processes [17].

   With a decrease in the chloride concentration in the model recycled water to 350 mg/l, a significant increase in the CPT of the 06XH28МДТ alloy has been found (Fig. 1). This is consistent with the data of papers [6, 7, 9, 10, 18–23]. It has been found that the CPT of melt No. 2 increased by 5°C and No. 4 by 8°C with an increase in the pH of the model recycled water from 4 up to 8. At the same time, it should be noted that, in the model-recycled water with pH 4, the CPT of melt No. 4 increased by 8°C, and with pH 8 by 10°C with a decrease in its chloride concentration from 600 mg/l down to 350 mg/l (Fig. 1). The same tendency for melt No. 2 has been observed, in particular, in the model-recycled water with pH 4, its CPT increased by 11°C, and with pH 8 up to 10°C with a decrease in the chloride concentration in the media from 600 mg/l down to 350 mg/l (Fig. 1).

   Summarising the above-mentioned ones, it can be noted that, in the studied model-recycled waters with pH 4–8 and chloride concentrations of 350 mg/l and 600 mg/l, the influence of the last parameter on the CTP of 06XH28МДТ alloy is more significant than that characterising its acidity. In addition, it is higher in melt No. 2 in model recycled water with pH 4, and No. 4 with pH 8. This is most likely due to the higher content of Mo and Cr in melt No. 2 than in No. 4 (Table 1), since Mo together with Cr form mixed oxides in the passive film that are more corrosion-resistant than chromium oxides [22]. The im-

provement of the protective properties of oxide films under conditions of alloy alloying with Mo is due to the adsorption of $(MoO_4)^{-2}$ ions on its surface, formed as a result of oxidative dissolution of Mo from the alloy and the squeezing out of chloride ions from its surface [22, 23]. In addition, such an effect of Mo on the pitting corrosion resistance of stainless steels and alloys is mainly observed in low acidic and close to neutral chloride-containing media, since these processes are associated with the adsorption of chlorine ions and $(MoO_4)^{-2}$ on the surface of steels and alloys [22].

Analysis of the data from paper [9] showed that the volume of titanium nitrides and sulphides does not affect the CPT of the 06ХН28МДТ alloy in model recycled waters with pH 4−8 and chloride concentration from 350 mg/l up to 600 mg/l, since they are 0.1427 and 0.0036% vol., respectively, and in the melt No. 4 and 5—0.1692, 0.003% vol. and 0.0931, 0.0036% vol., respectively. It is obvious that the atomic-electronic state of austenite may have a greater influence on the activation of metals in the vicinity of these inclusions by chloride ions in model recycled water than the imperfections of the structure in these places. The specific magnetic susceptibility characterises the atomic-electronic state of the austenitic matrix of steels and alloys [12], so we further investigated the correlation between the CPT of the 06ХН28МДТ alloy and its specific magnetic susceptibility (Fig. 2).

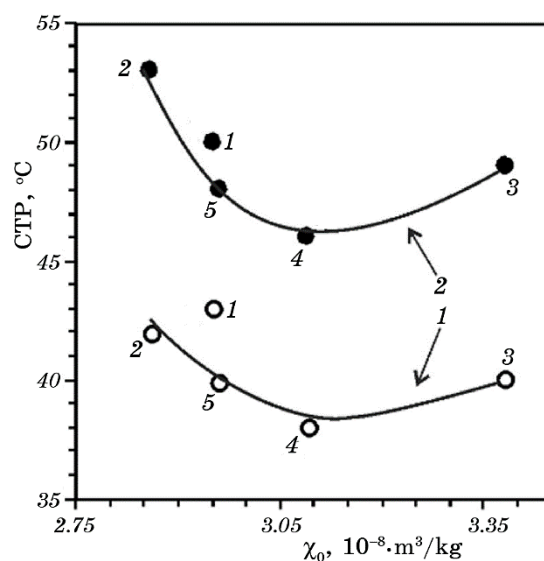According to the results of the analysis (Fig. 2), it has been found

Fig. 2. Relationship between the CPT of 06ХН28МДТ alloy and its specific magnetic susceptibility in model-recycled water with pH 4 and chloride concentration of 350 mg/l (curve *1*) and 600 mg/l (curve *2*).

that in the model recycled water with pH 4 and chloride concentration of 350 mg/l, the CPT of the 06ХН28МДТ alloy intensively decreased from 53°C melt No. 2 down to 46°C melt No. 4 with an increase in their χ_0 from 2.86 m³/kg melt No. 2 up to 3.09 m³/kg melt No. 4 (Table 2), but then its rapid growth up to 49°C melt No. 3 with an increase in its χ_0 up to 3.38 m³/kg has been observed (Table 2). It should be noted that in the model recycled water with pH 4 and a chloride concentration of 600 mg/l, the same dependence between the CPT of the 06ХН28МДТ alloy and its χ_0 has been found (Fig. 2). At the same time, the intensity of the decrease and increase in its CPT with an increase in the value of χ_0 was somewhat lower (Fig. 2). This may indicate the presence of a correlation between the chlorides' concentration in the model-recycled water and the ability to absorb the chloride ions on the surface of the alloy, depending on the atomic and electronic state of its austenitic matrix.

It should be noted that in the model recycled water with pH 4 and chloride concentration of 600 mg/l, melts No. 5 and No. 3 have the same CPT (40°C), but different values of the χ_0 parameter (2.96 m³/kg and 3.38 m³/kg, respectively (Table 2)). At the same time, melt No. 5 contains more Cr, Ni, Cu, and Ti than No. 3 (Table 1) with almost the same Mo content (2.51% wt. and 2.55% wt., respectively). However, the volume of titanium nitrides (0.1918% wt.) and sulphides (0.0043% wt.) in melt No. 3 is higher than in No. 5 (0.0931% wt. and 0.0036% wt., respectively). It turns out that these inclusions in the 06ХН28МДТ alloy compensate for the lower content of Cr [6, 7, 12, 24, 25], Ni [26, 27], Mo [28–30], Cu [29] and Ti [31] in the melt No. 3 in terms of its resistance to pitting corrosion in chloride-containing media, since it is known [24–31] that these alloying elements in steels and alloys increase their pitting corrosion resistance. This is consistent with the data of papers [5, 9] and [24], which mention the positive effect of carbides in stainless steels on their pitting resistance in chloride-containing media due to an increase in hydrogen ionisation overvoltage on them in acidic and low acidic solutions.

The synergistic effect of the parameter χ_0 of the 06ХН28МДТ alloy and the volume of inclusions in it on its CPT in model recycled waters has been established above, so the characteristic features of the selective dissolution of ΔCr, ΔNi and ΔFe from pitting in the vicinity of these inclusions (Fig. 3), depending on this integral alloy characteristic (χ_0), are of scientific and technical interest.

The analysis of the relationship between ΔFe of the 06ХН28МДТ alloy from pitting and its χ_0 showed that ΔFe intensively increases from $783 \cdot 10^{-6}$ mg melt No. 2 up to $3138 \cdot 10^{-6}$ mg melt No. 1 with an increase in the χ_0 parameter from 2.86 m³/kg melt No. 2 up to 2.95 m³/kg melt No. 1 (Fig. 4). This is most likely due to the higher content of Cr (24.31% wt.), Mo (2.9% wt.), Cu (2.75% wt.), Ti (0.79% wt.) (Table
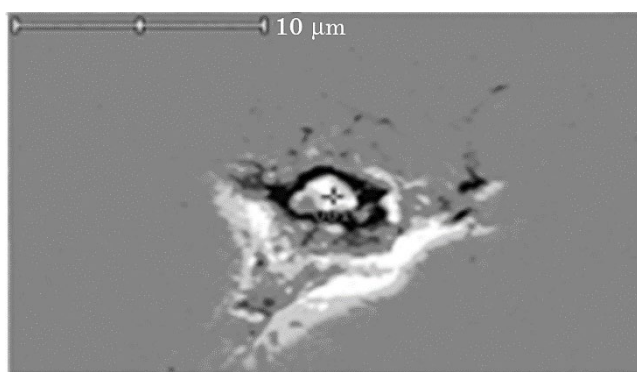
Fig. 3. Pitting nucleation in the vicinity of an inclusion (×600).

1), the volume of nitrides (0.1711% wt.) and sulphides (0.0091% wt.) of titanium [9] in the melt No. 1 than in No. 2 (22.68, 2.71, 2.68, 0.59% wt. (Table 1), 0.1427 and 0.0036% vol. [9], respectively). Further, a rapid drop in ΔFe from $3138 \cdot 10^{-6}$ mg in the melt No. 1 down to $111 \cdot 10^{-6}$ mg in the melt No. 5 with an increase in χ_0 of the alloy from $2.95 \, \text{m}^3/\text{kg}$ in the melt No. 1 up to $2.96 \, \text{m}^3/\text{kg}$ in the melt No. 5 has been recorded (Fig. 4). Obviously, this is due, first of all, to a decrease in the volume of titanium nitrides and sulphides in the melt No. 5 down to 0.0931% vol. and 0.0036% vol., respectively [9], and Cr and Mo down to 23.4% wt. and 2.51% wt. (Table 1), respectively (Fig. 4).

After that, it has been found that the ΔFe of the alloy from pitting rapidly increased from $112 \cdot 10^{-6}$ mg melt No. 5 up to $4651 \cdot 10^{-6}$ mg melt No. 4 and $5155 \cdot 10^{-6}$ mg melt No. 3 with an increase in their χ_0 parameter from $2.96 \, \text{m}^3/\text{kg}$ melt No. 5 up to $3.09 \, \text{m}^3/\text{kg}$ melt No. 4 and $3.38 \, \text{m}^3/\text{kg}$ melt No. 3 (Table 2). Most likely, this trend is due to the lowest content of Cr, Mo, Cu in these melts (Table 1) and the largest volume of inclusions, in particular in melts 3 and 4 of nitrides 0.1918% vol. and 0.1692% vol. and sulphides 0.0043% vol. of titanium [9].

Summarising the above, it turns out that the lower the pitting repassivation ability provided by Cr and Mo, more intense the metal ionisation in them, which is 'inhibited' by Cu, shifting the pitting potential of the alloy to the positive side, and the more imperfect the austenite structure in the vicinity of the inclusions, the more intense the selective dissolution of iron atoms from the pits on the surface of the 06ХН28МДТ alloy.

The analysis (Figs. 4, 5) showed that the corrosion losses ΔCr from pitting of melts Nos. 2, 1, 5 of 06ХН28МДТ alloy and their index χ_0 have the same relationship as between ΔFe and χ_0. Thus, it can be assumed that the mechanisms of influence of alloy alloying elements and
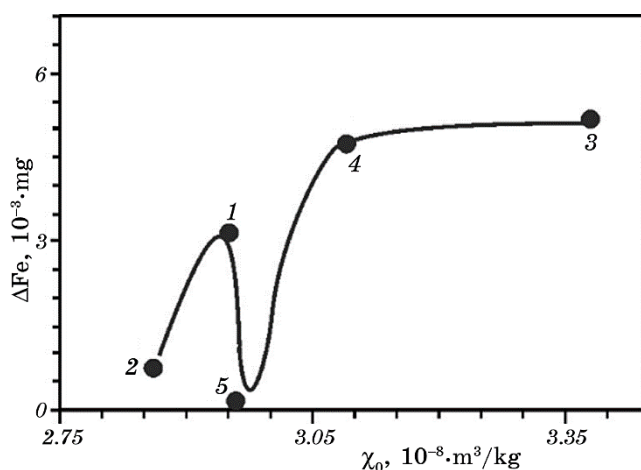
Fig. 4. Dependence between corrosion losses ΔFe from pitting on the surface of 06ХН28МДТ (numbers near the dots are the melts numbers) alloy and its specific magnetic susceptibility χ_0 of austenite in model recycled water with pH 4 and chloride concentration of 600 mg/l.

its structure components on ΔCr from pitting are the same as those on ΔFe mentioned above. However, with an increase in the χ_0 of the studied alloy from 2.96 m^3/kg melt No. 5 up to 3.09 m^3/kg melt No. 4 and 3.38 m^3/kg No. 3 (Table 2), a slow decrease in ΔCr from $1109 \cdot 10^{-6}$ mg of No. 5 down to $900 \cdot 10^{-6}$ mg of No. 4 and $796 \cdot 10^{-6}$ mg of No. 3 has been observed (Fig. 5). This feature of the selective dissolution of ΔCr and ΔFe from the pittings of melts Nos. 3 and 4 of 06ХН28МДТ alloy is inherent in the selective dissolution of atoms of these metals from stable pittings. Under such conditions, iron atoms diffuse in the nanovolumes of the alloy austenite solid solution to their surface, and Cr atoms—in the opposite direction, which contributes to the reorganization of metal nanovolumes in their vicinity with the emergence of nonequilibrium vacancies that diffuse into its volume, where they coagulate and form pores [32–34].

At the same time, according to [35], the less thermodynamically stable alloy components Cr and Mn than Fe dissolve selectively and accelerate its dissolution. At the same time, Cu, which is more thermodynamically stable than Fe, accumulates on the alloy surface and slows down the dissolution of Fe [36]. This is consistent with the results of these studies, in particular, in the melts Nos. 1, 2, 5 of the 06ХН28МДТ alloy, the largest amount of Cu (2.75, 2.68, and 2.78% wt., respectively) and they susceptible to pitting corrosion with the formation of metastable pits on their surface, since their coefficients of selective dissolution of Cr from pittings $Z_{Cr} > 1$ (1.26, 3.75, and 17.5, respectively; see Fig. 6). This shows that under such conditions,
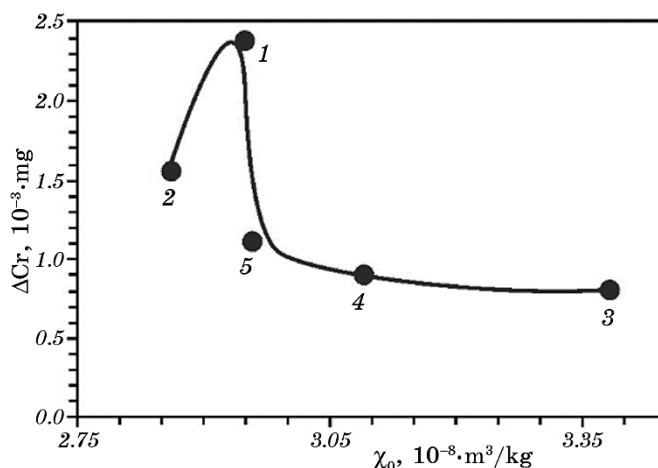
Fig. 5. Dependence of corrosion losses ΔCr from pitting on the 06ХН28МДТ (numbers near the dots are the melts numbers) alloy surface on its specific magnetic susceptibility χ_0 of austenite in model-recycled water with pH 4 and chloride concentration of 600 mg/l.

chromium dissolves more intensively from pittings. This trend, as mentioned above, is associated with the accumulation of copper on their surface.

Analysis of the data (Fig. 6, Tables 1, 2) and the volume of inclusions in the melts Nos. 1–5 of 06ХН28МДТ alloy [9] showed that metastable pittings on their surface is formed in a chloride-containing me-
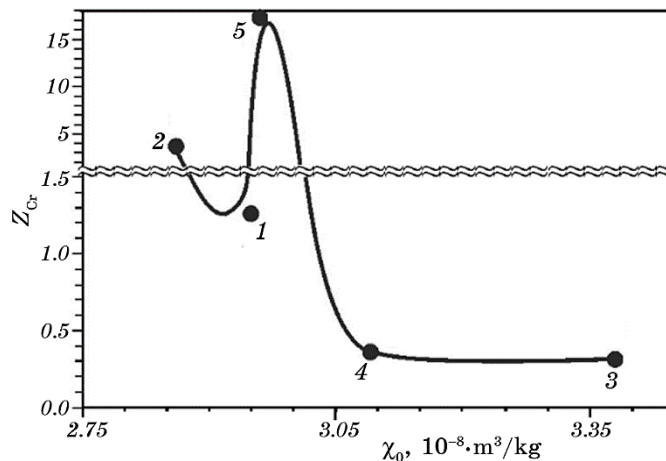

Fig. 6. Dependence of the coefficient of chromium selective dissolution from pitting (Z_{Cr}) on the 06ХН28МДТ (numbers near the dots are the melts numbers) alloy surface of and its specific magnetic susceptibility χ_0 of austenite.

dia with a pH of 4 and a chloride concentration of **600** mg/l, which can be formed on the surface of melt exchangers from recycled water sludge, at volumes of titanium nitride and sulphide up to **0.1692%** vol. and **0.0043%** vol., respectively, the value of χ_0 from **2.86** m³/kg up to **3.09** m³/kg, Cr content up to **22.67%** wt., Cu more than **2.6%** wt. Other alloy parameters mentioned above contribute to the formation of stable pittings on its surface under the same test conditions.

The data analysis (Fig. 7) showed that the dependence of ΔNi of the 06XH28MДT alloy from pittings on its χ_0 parameter is the same as that of ΔCr (χ_0) (Fig. 5). Thus, the mechanisms of influence of the parameter χ_0 on ΔNi from pits are similar to its influence on ΔCr, which were mentioned above.

At the same time, it should be noted that under such test conditions, ΔNi of the alloy from pittings varied from $3748 \cdot 10^{-6}$ mg melt No. 3 up to $8406 \cdot 10^{-6}$ mg of melt No. 5 (Fig. 7), and ΔFe from $112 \cdot 10^{-6}$ mg melt No. 5 up to $5155 \cdot 10^{-6}$ mg of melt No. 3 (Fig. 5). Because of this, the coefficients of selective chromium dissolution from pittings Z_{Cr} of melts Nos. 3 and 5 were **0.31** and **17.5**, respectively (Fig. 6), and Z_{Ni} is **1.16** and **75.3**, respectively (Fig. 8). It turns out that melt No. 3 of the 06XH28MДT alloy susceptible to pitting corrosion with the formation of stable pits, and No. 5—metastable pittings. In addition, in melt No. 3, the intensity of metal dissolution from pitting increased in the following range: ΔCr, ΔFe, and ΔNi. As a result, stable pittings grew slowly, since the main component of the alloy, iron, dissolved more slowly than nickel, which contributed to a decrease in the number of
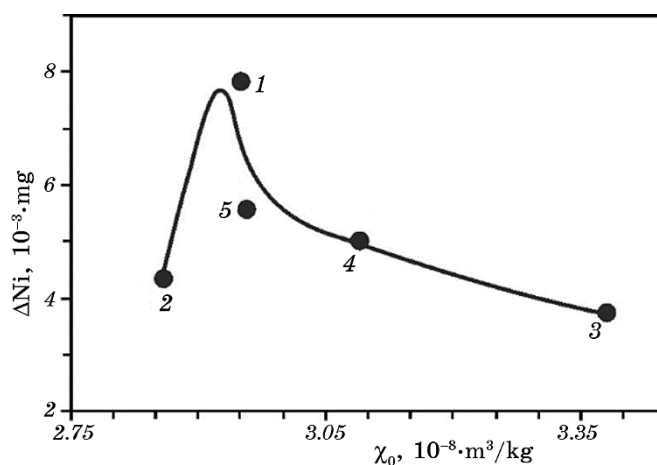

Fig. 7. Dependence of corrosion losses ΔNi from pitting on the 06XH28MДT (numbers near the dots are the melts numbers) alloy surface and its specific magnetic susceptibility χ_0 of austenite in model recycled water with pH 4 and chloride concentration of **600** mg/l.
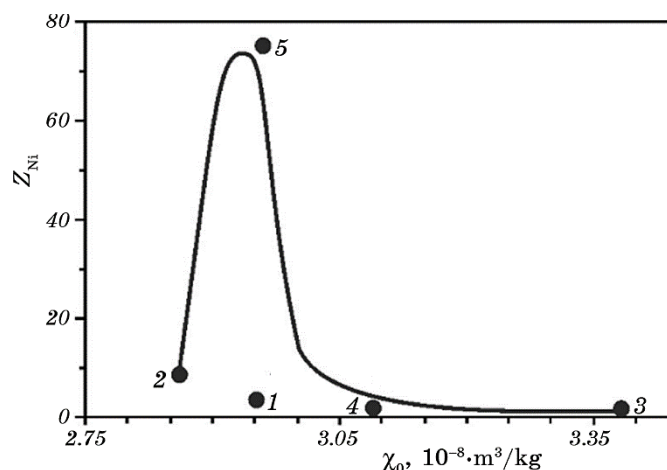
Fig. 8. Dependence between the nickel selective dissolution coefficient from pitting Z_{Ni} on the 06ХН28МДТ (numbers near the dots are the melts numbers) alloy surface and its specific magnetic susceptibility χ_0 of austenite.

nonequilibrium vacancies and corrosion pores in the vicinity of the pittings, as mentioned in [31–33]. However, the intensity of metal dissolution from pittings in the following range increased in the melt No. 5: ΔFe, ΔCr, and ΔNi. This contributed to the solid-phase diffusion of chromium atoms to their surface and the repassivation of metastable pittings due to the formation of dense chromium containing oxide film on their surface formed in the process of counter-diffusion of chromium and oxygen atoms.

Summarising the above-mentioned ones, it can be noted that in the studied model recycled waters, the effect of chloride concentration on the CPT of 06ХН28МДТ alloy is greater than their pH. This tendency is most pronounced in a low acidic media, which is due to the formation of dense Cr and Mo containing oxide films on their surface, which effectively counteract the formation of pittings. At the same time, the CPT of an alloy decreases with an increase in its specific magnetic susceptibility, and, at a high values of χ_0 and the volume of titanium nitrides and sulphides in the alloy, its CPT can increase that is most likely due to an increase in the hydrogen ionisation overvoltage on inclusions, in the vicinity of which pittings are formed in low acidic model-recycled water and a change in the characteristics of selective dissolution of ΔCr, ΔNi and ΔFe from pittings. In particular, pitting with the formation of metastable pitings on their surface at low values of χ_0 is characteristic of melts Nos. 1, 2, 5, and stable pitting with a maximum value of χ_0 is inherent in melts Nos. 3, 4. At the same time, the coefficients Z_{Cr} and Z_{Ni} decrease with an increase in the parameter χ_0 that may indicate an intensive growth of stable pitting.

4. CONCLUSION

According to the results of the study, it has been found that in model-recycled waters with a chloride concentration of 350 mg/l and 600 mg/l, the CPT of the 06ХН28МДТ alloy increases by 5–8°C with an increase in their pH from 4 up to 8. At the same time, they increase by 10−11°C with a decrease in the chloride content in the media from 600 mg/l down to 350 mg/l, regardless of their pH in the studied interval. It has been found that in model recycled waters with pH 4 and a chloride concentration of 350 mg/l, the CPT of the alloy decreases from 53°C down to 46°C, and with 600 mg/l from 42°C down to 38°C with an increase in its specific magnetic susceptibility χ_0 of austenite from 2.86 m^3/kg up to 3.09 m^3/kg. A further increase in the alloy χ_0 parameter up to 3.38 m^3/kg contributes to an increase in its CPT up to 49°C in a media with pH 4 and 350 mg/l and up to 40°C with pH 4 and 600 mg/l. This tendency is due to the synergistic effect of the alloy χ_0 parameter, the high content of titanium nitrides and sulphides in it, and the characteristic features of the selective dissolution of ΔCr, ΔNi, and ΔFe from pitting. In particular, it is shown that the highest content of these inclusions in the alloy and the highest value of the parameter χ_0 (3.09 m^3/kg, 3.38 m^3/kg) is inherent in its pitting with the formation of stable pitting, so the coefficients of selective dissolution of chromium from them are less than one, and $Z_{Ni} > 1$, which is characteristic of their slow growth.

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