

was preceded by the following electrochemical pretreatment: 30 min at -0.7 V and 15 min at 0.0 V. Then the potential was

| E_p / V | t_i / s |
|-----------|-----------|
| 0.3 | 24.0 |
| 0.3 | 28.6 |
| 0.3 | 31.0 |
| 0.3 | 30.1 |
| 0.3 | 29.0 |
| 0.3 | 31.5 |
| 0.3 | 24.5 |

stepped to 0.3 V (middle pitting potential). The current minimum determines an induction times (t_i) for stable pit initiation. The resulting of induction times are listed in Table I.

d) Surface observations.-

Scanning micrograph of surfaces show a small numbers of macroscopical pits with a non cristallographic structure and electropolished hemispherical shape (Fig.4).

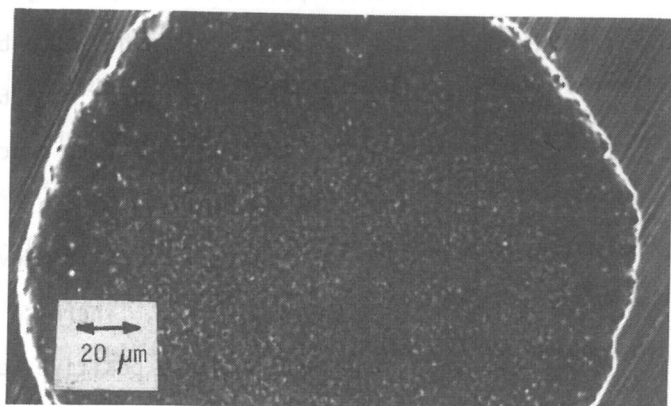


Fig.4

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INFLUENCE OF "PSEUDOMONAS AERUGINOSA" ON THE PITTING CORROSION OF A 18/8 STAINLESS STEEL IN PHOSPHATE-BORATE IN THE PRESENCE OF NaCl

II.- MICROBIOLOGICALLY INFLUENCED CORROSION.

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INTRODUCTION

Microbiologically influenced corrosion (MIC) has received increased attention by corrosion scientists and engineers in recent years. MIC is due to the presence of microorganisms on a metal surface which leads to changes in the rates and sometimes also the types of the electrochemical reactions which are involved in the corrosion processes (1).

All the engineering materials in general use, with few exceptions, are susceptible to some form of microbial corrosion which usually arises from the activity of a wide range of microorganisms and their metabolic products. In addition, the microorganisms are ubiquitous and are able to colonise surface and, by genetic mutation, acquire the ability to adapt to environmental changes. Because of this they represent a dynamic systems which is able to change with the time.

The present work studies the electrochemical behaviour of AISI 304 stainless steel (304 SS) in buffered media containing NaCl in the presence of "Pseudomonas aeruginosa".

EXPERIMENTAL

The working electrode were made of 304 SS rods mechanically polished with a fine-grained 600 emery paper to expose a surface area of 0.3 cm². The counter electrode was a large platinum sheet and a saturated calomel electrode (SCE) was used as reference. Electrochemical experiments were conducted at 25 ± 0.1 °C.

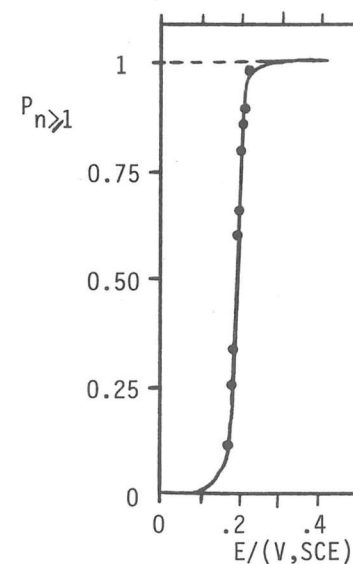
The electrolyte consisted of 0.1 M KH₂PO₄ + 0.05 M Na₂B₄O₇ (pH=7.5) + 0.5 M NaCl aqueous solutions. All chemical used were of analytical grade. Solutions were prepared in double distilled water.

The medium was sterilized by autoclaving at 120°C for 15 minutes. "Pseudomonas aeruginosa" isolated from natural sea water, were used. Specimens of 304 SS were submerged in phosphate-borate buffer, containing 10⁻² M saccharose as carbon source, inoculated with "Pseudomonas aeruginosa". Incubation was made at 37°C during seven days.

RESULTS

a) Anodic polarization.

In order to obtain the pitting potential, E_p, anodic polarization curves were made in phosphate-borate buffer + 0.5 M NaCl at 1.6 · 10⁻⁴ V.s⁻¹ from -0.7 to reach E_p. The probability that at least a specimen of 304 SS develops pits, P_n ≥ 1 increase as E moves in the positive direction (Fig.1). The pitting potential were found in a 0.1 V range with center in 0.2V.



(Fig.1)

b) Current transients at constant potential.

Current-times transients at constant potential were also recorded with phosphate-borate buffer + 0.5 M NaCl solutions. The potential step applied to the electrode was preceded by an electrode pretreatment, including the sequent sequence potential: 30 min at -0.7 V and 15 min at 0 V, then the potential was stepped to the middle pitting potential value (0.2 V). The current initially decreases and after a certain time, t_i, (the induction time) the current increases. The resulting of the induction times are listed in Table I.

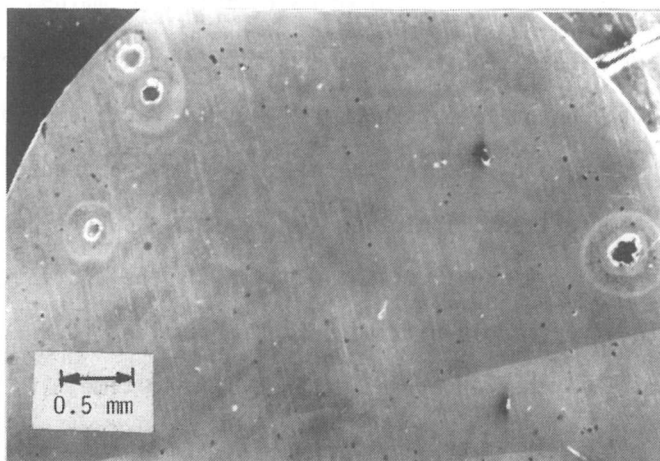
TABLE I

| E _p / V | t _i /s |
|--------------------|-------------------|
| 0.2 | 18.5 |
| 0.2 | 16.0 |
| 0.2 | 15.5 |
| 0.2 | 19.0 |
| 0.2 | 17.0 |
| 0.2 | 19.6 |

The value of pitting potentials and induction times decreases in presence of "Pseudomonas aeruginosa", therefore, the localized corrosion process are favored in presence of this one. This fact is possibility due at the formation of a biofilm in the passive layer containing.

b) Surface observations.-

Optical examinations of the specimens used in the anodic polarizations show a small number of macroscopical pits and a great number of microscopical pits (fig.2). SEM microphotograph exhibit a non hemispherical pits structures.



(Fig.2)

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The corrosion and passivity of copper in aqueous solutions containing sodium perchlorate.

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1. INTRODUCTION

The electrochemical behaviour of copper in alkaline aqueous solutions was the matter of a number of studies which reveal the complex nature of the processes taking place in different potential ranges and how those processes are influenced by the solution composition. In general, the anodisation of Cu in aqueous solutions produces different copper oxides and hydroxides, and Cu(I) and Cu(II) soluble species. The onset of the passivity of Cu has been related to the formation of a duplex layer made of an inner Cu_2O layer and outer CuO layer. Depending on the nature of the anions present in the solution insoluble salts precipitate upon the passive layer, sometimes being also capable for blocking the growth of pits at the Cu surface. Conversely more soluble salts result in a more extensive attack including pitting corrosion of Cu.

The comparative electrochemical behaviour of Cu in alkaline solutions containing perchlorate, and carbonate and bicarbonate anions showed that the former behaves as an aggressive anion for Cu pitting, a fact which is not surprising after the great solubility of $\text{Cu}(\text{ClO}_4)_2$ in aqueous solutions.

2. RESULTS AND DISCUSSION

2.1. Voltammetric data.

Voltammograms run with 0.1M NaClO_4 at pH 9.1 exhibit on the potential going scan a well defined peak at -0.24V.(peak Ia) which is related to the Cu_2O electroformation. At potentials more positive than 0.02V. a remarkable current increase is observed. The negative scan shows a considerable hysteresis in the anodic current preceding a broad peak, X, at 0.0V. which partially masks other contributions. Thus, when the potential is reversed at values slightly more negative than 0.02V. (dash line), the small cathodic current peak . IIc can be