

de irídio foi conseguido utilizando as seguintes metodologias:

(i) Polarização do electrodo a +1,85 V, (região da evolução do O_2), durante alguns minutos (\approx 20 a 30 minutos), e desarejamento simultâneo da solução com N_2 ;

(ii) Tratamento à chama de gás butano, durante alguns segundos.

O processo (ii) é mais rápido e eficiente: os efeitos conseguidos (redução do óxido) são independentes da natureza e da espessura do filme.

Em termos de estabilidade pode concluir-se que em meio perclórico se obtêm estados mais estáveis do que em meio sulfúrico, e ainda, que os filmes obtidos por impulsos de potencial são mais estáveis do que os obtidos por varrimentos cíclicos.

Os resultados mostram, claramente, que a natureza do electrolito assim como a sua concentração, têm um papel predominante tanto na cinética como na natureza e morfologia dos filmes resultantes da polarização electroquímica do irídio.

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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

I.- CHLORIDE ANIONS ACTION.

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INTRODUCTION

In solution containing chloride anions, the pitting corrosion can be obtained when the electrode potential exceeds a certain critical value (E_p). The initiation of pitting corrosion has been considered as a rare event both in space and time and consequently it can be treated as a statistical phenomenon (1-4).

The pitting corrosion of 304 stainless steel (304 SS) in a strong buffered chloride ions containing medium has been studied by using the potentiodynamic and potentiostatic techniques complemented with scanning electron microscopy observations.

EXPERIMENTAL

Working electrodes were made of 304 SS rods with a circular exposed area of $\approx 0.3 \text{ cm}^2$ geometric area. Firstly, the metal surface was mechanically polished with fine grained emery paper and finally with 600 emery paper. Each polished specimen was rinsed with acetone, bidistilled water and finally dried in air at room temperature. A new pretreated specimen was used for each run. Measurements were made at 25°C with a conventional Pyrex glass cell containing the electrolyte solutions. The potential of the working electrode was measured against a saturated calomel electrode (SCE) provided with a Luggin-Haber capillary. All potentials in the text are referred to the SCE. The electrolyte prepared from A.R. chemicals and bidistilled water consisted of 0.10 M

$\text{KH}_2\text{PO}_4 + 0.05\text{M Na}_2\text{B}_4\text{O}_7$ (pH=7.5) containing 0.5 M NaCl. Previously to each run the solution was deaerated with purified argon during 1 h.

The specimen-electrolyte contact were made by a hanging meniscus to exposed only the polished area.

RESULTS

a) Voltammetric results.-

Voltammograms resulting for 304 SS specimens in phosphate-borate buffer run at 0.02 Vs^{-1} between $E_{s,a} = -1.2 \text{ V}$ and $E_{s,c} = 1 \text{ V}$ show three anodic current peaks at -0.7 V (Ia), at -0.4 V (IIa) and at 0.8 V (IIIa) (Fig.1). The returning scan present two cathodic current peaks one located at 0.0 V (IIIc) and another one at -0.5 V (IIc). Peak Ia can be assigned to the electroformation of a $\text{Fe}(\text{OH})_2$ layer on the pre-existing Cr_2O_3 layer (5). The hydrous $\text{Fe}(\text{OH})_2$ film is electro-oxidized to hydrous FeOOH at potentials corresponding to current peak IIa yielding a complex film of inner Cr_2O_3 and outer FeOOH (5,6). Peak IIIa was associated with the electro-oxidation of Cr(III) to Cr(VI). The electro-reduction of Cr(VI) in the film to Cr(III) was related to peak IIIc while the broad peak IIc was assigned to the electro-reduction of hydrous FeOOH film (6,7). The j/E profiles recorded in the phosphate-borate buffer containing 0.5 M NaCl show similar current peaks although when the potential exceeds a certain critical values (E_p) a remarkable increase in current due to the initiation of pitting corrosion can be observed (Fig.2). The returning scan exhibits a considerable hysteresis loop which extends from E_p to a potential E_r (repassivation potential) located at 0.1 V

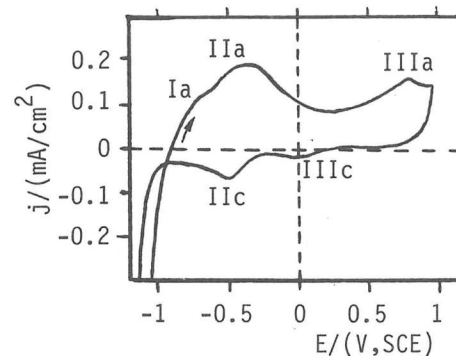


Fig.1

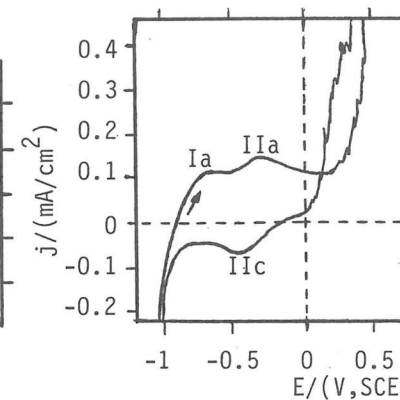


Fig.2

and present at -0.5 V a similar current peak.

b) Anodic polarization.-

In order to obtain the critical potential for pitting, E_p , anodic polarization curves were made in the phosphate-borate buffer +0.5 M NaCl at $1.6 \cdot 10^{-4} \text{ Vs}^{-1}$ from -0.7 V to reach E_p . The probability that at least a specimen of 304 SS develops pits, $P_n \geq 1$, increase as E moves in the positive direction (Fig.3). The pitting potentials were found in a 0.1V range with center in 0.3V

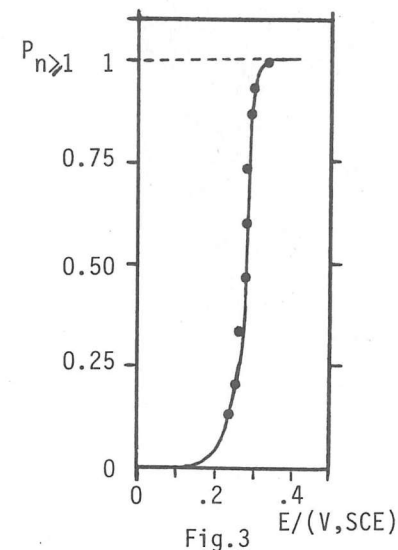


Fig.3

c) Potentiostatic current transients.-

The current transients were run at constant potential corresponding with a middle pitting potential. Each current transient

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).

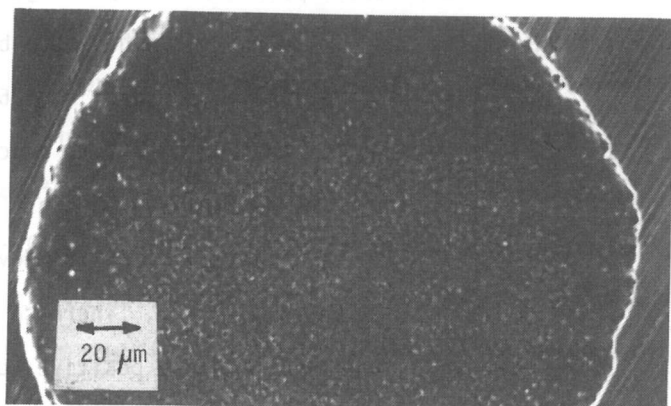


Fig.4

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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".