



CORROSION RESISTANCE OF SS 316 L ALLOY & SS 18/8 ALLOY IN ARTIFICIAL SALIVA (AS) IN THE ABSENCE AND PRESENCE OF AN AQUEOUS EXTRACT OF BROWN INDIAN HEMP

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ABSTRACT

The Corrosion Resistance of SS 316 L alloy & SS 18/8 alloy in artificial saliva, in the absence and presence of Brown Indian hemp leaves extract has been investigated by electrochemical study namely, Polarization study. Corrosion Parameters such as Corrosion Current, Linear Polarization Resistance, Tafel Slopes (b_c = Cathodic; b_a = anodic) and Corrosion Potential (E_{corr}) have been calculated from the Tafel Plots. It is observed that for SS 316 L and SS 18/8 system, the corrosion resistance decreases in the presence of Brown Indian hemp leaves extract. So people implanted with orthodontic wire made of SS 316 L alloy and SS 18/8 alloy should avoid taking Brown Indian hemp leaves juice orally.

KEYWORDS: Artificial Saliva, Corrosion resistance, Brown Indian hemp leaves extract, SS 316 L, SS 18/8.

1. INTRODUCTION

To regulate the growth of teeth, dentists make use of orthodontic wires made of different metals and alloys. For this purpose orthodontic wires made of several metals and alloys have been used. Vieira et al., have studied the tribo corrosion of Ti in artificial saliva (AS) in presence of citric acid and sodium nitrate.^[1] Mareci et al., have analysed the corrosion resistance of Ni-Co based alloy in AS.^[2] The influence of eugenol of the corrosion resistance of Ti in AS has been studied.^[3] Ziebowicz et al., have evaluated the corrosion resistance of commercial metallic or wires in simulated intra-oral environmental.^[4] Chenglong Liu et al., have studied the corrosion resistance of CrNi, NiTi, CuNiTi wires in AS.^[4] Corrosion behaviors of NiTi orthodontic brackets in AS has been investigated.^[5] Rajendran et al., have studied the corrosion behavior metals in AS in presence of spirulina powder.^[6] Corrosion behavior metals in AS in presence of D-glucose has been investigated.^[7] Corrosion behavior of SS316L in AS in presence of electrol has been studied by Rajendran et al.^[8]

The present work is undertaken to evaluate corrosion resistance of orthodontic wires made of SS 316 L alloy and SS 18/8 alloy in AS in the absence and presence of Brown Indian Hemp leaves Extract by polarization study.

2. Experimental

Orthodontic wires made of SS 316 L alloy and SS 18/8 alloy are used in the present study. The metal specimens were used as working electrode. They were immersed in Fusayamma Meyer artificial saliva whose composition is.^[8]

Table 1: Composition of Artificial Saliva.

S. No	Name	Wt/lit
1	KCl	0.4 g/l
2	NaCl	0.4 g/l
3	Urea	1 g/l
4	CaCl ₂ .H ₂ O	0.906 g/l
5	Na ₂ S ₉ H ₂ O	0.005 g/l
6	NaH ₂ PO ₄ .2H ₂ O	0.690 g/l

The pH of the solution was 6.5.

2.1 Preparation of Brown Indian Hemp Extract

Brown Indian Hemp tree leaves were dried in the shade. 50gms of the leaves was boiled with well water and the extract was made up to 100ml.

2.2 Polarization study

Polarization studies were carried out in a CHI-Electrochemical workstation with impedance, Model 660A. A three-electrode cell assembly was used. The working electrode was SS316 L alloy and SS 18/8 alloy. A saturated calomel electrode (SCE) was the reference

electrode and platinum was the counter electrode. From the polarization study, corrosion parameters such as corrosion potential (E_{corr}), corrosion current (I_{corr}) and Tafel Slopes (anodic = b_a and cathodic = b_c) were calculated.

3. RESULT AND DISCUSSION

3.1 Analysis of Polarization curves

Corrosion resistance of SS 316 L alloy and SS 18/8 alloy in Artificial Saliva in the absence and presence of Brown Indian Hemp tree leaves extract has been evaluated by polarization study. When corrosion resistance increases,

Linear Polarization Resistance (LPR) decreases; Corrosion current (I_{corr}) increases for SS 316 L alloy and SS 18/8 alloy in presence of Brown Indian Hemp tree leaves extract and Artificial Saliva[9-15].

3.2. SS 316 L alloy and SS 18/8 alloy

Corrosion resistance of SS 316 L alloy and SS 18/8 alloy immersed in various test solutions are shown in the figures. The corrosion parameters namely Corrosion Potential (E_{corr}), Tafel slopes (b_c = cathodic; b_a = anodic), Linear Polarization Resistance (LPR) and Corrosion current (I_{corr}) are shown in table 2.

Table 2: Corrosion parameters of SS 316 L alloy and SS 18/8 alloy immersed in Artificial Saliva (AS) in the absence and presence of Brown Indian hemp leaves extract obtained from polarization study.

System	LPR ohmcm ²	I_{corr} A/cm ²	E_{corr} mV vs SCE	b_c mV/ decade	b_a mV/ decade
SS 316 L +AS	906670	4.888×10^{-8}	-534	165	265
SS 316 L + AS + Brown Indian hemp leaves	581756	9.574×10^{-8}	-614	193	379
SS 18/8 +AS	610982	6.945×10^{-8}	-644	171	226
SS 18/8 + AS +Brown Indian hemp leaves	469601	9.574×10^{-8}	-639	176	250

When SS 316 L alloy immersed in Artificial Saliva (AS), Linear Polarization Resistance (LPR) value is 906670 ohm cm². The Corrosion current (I_{corr}) is 4.888×10^{-8} A/cm². The Corrosion Potential (E_{corr}) is -534 mV vs SCE. When SS 18/8 alloy immersed in Artificial Saliva (AS), Linear Polarization Resistance (LPR) value is 610982 ohm cm². The Corrosion current (I_{corr}) is 6.945×10^{-8} A/cm². The Corrosion Potential (E_{corr}) is -644 mV vs SCE.

When SS 316 L alloy immersed in the system consisting of AS and Brown Indian Hemp tree leaves extract, the LPR value decreases to 581756 ohm cm², the corrosion current increases to 9.574×10^{-8} A/cm². This indicates the SS 316 L alloy is less corrosion resistant in AS + Brown Indian hemp tree leaves extract system than in AS system.

When SS 18/8 alloy immersed in the system consisting of AS and Brown Indian Hemp tree leaves extract, the LPR value decreases to 469601 ohm cm², the corrosion current increases to 9.574×10^{-7} A/cm². This indicates the SS 18/8 alloy is less corrosion resistant in AS + Brown Indian hemp tree leaves extract system than in AS system.

Thus the polarization study leads to the conclusion that SS 316 L alloy and SS 18/8 alloy are less corrosion resistant in presence of AS and Brown Indian hemp tree leaves extract.

This study reveals that people having orthodontic wires made of SS 316 L alloy and SS 18/8 alloy should avoid taking Brown Indian Hemp tree leaves extract orally. Because in this medium the corrosion resistance of SS 316 L alloy and SS 18/8 alloy decreases.

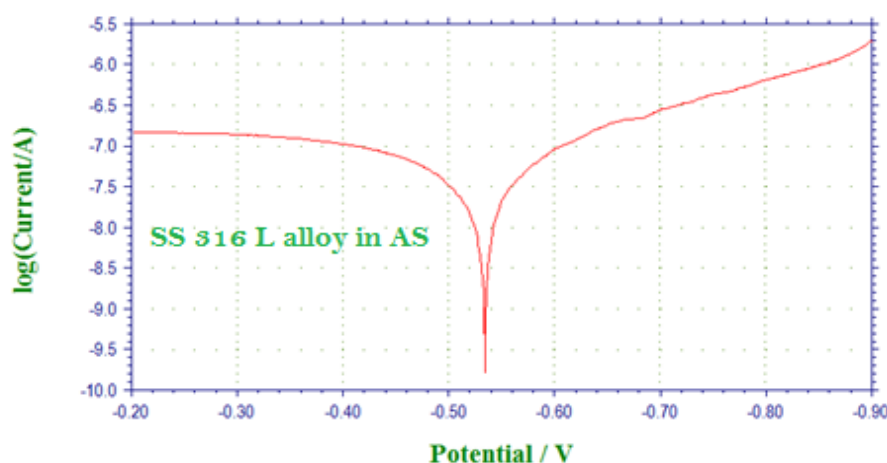


Fig 1: Polarisation curve of SS 316 L alloy immersed in AS.

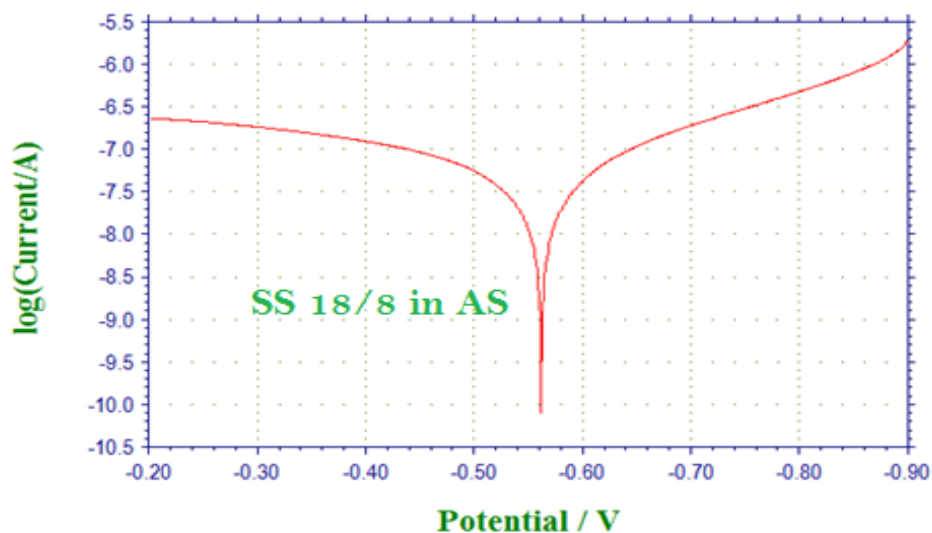


Fig 2: Polarisation curve of SS 18/8 alloy immersed in AS.

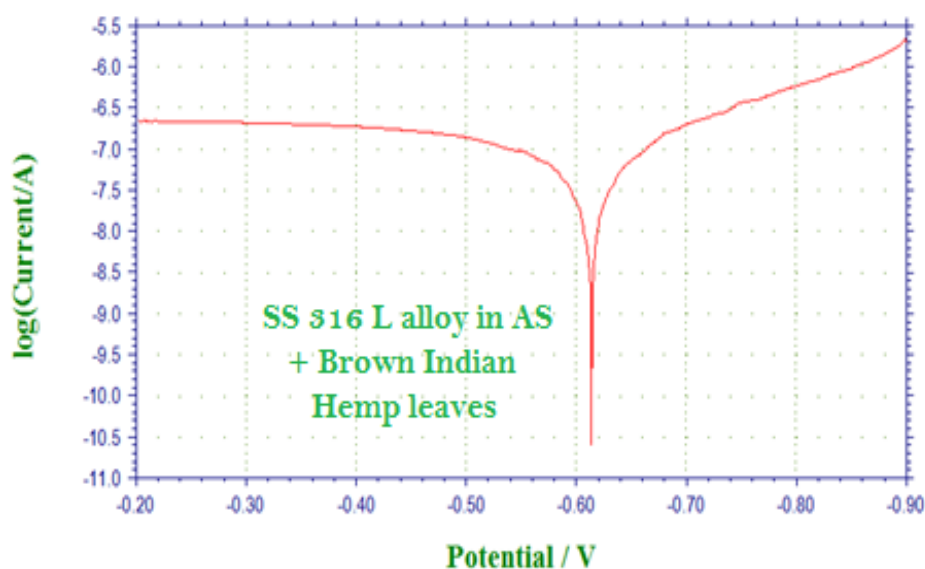


Fig 3: Polarisation curve of SS 316 L alloy immersed in AS + Brown Indian Hemp tree leaves extract.

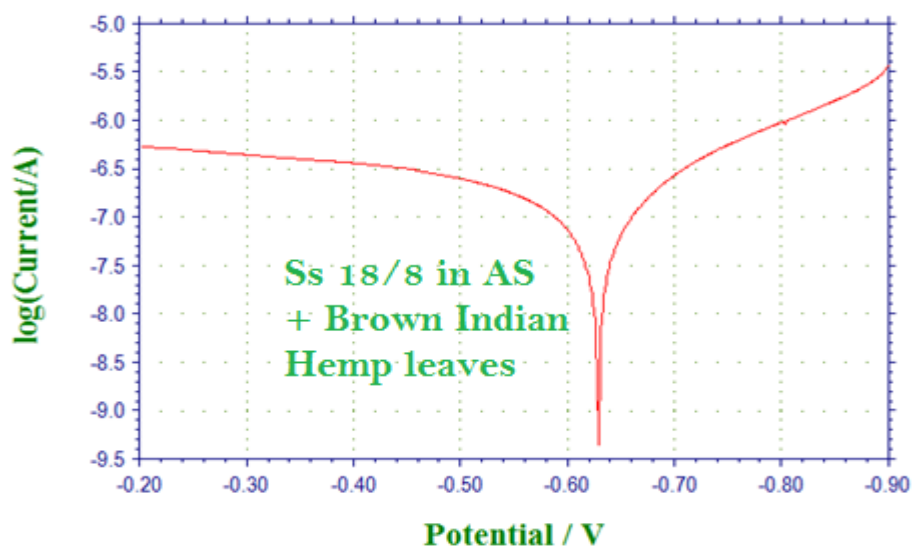


Fig 4: Polarisation curve of SS 18/8 alloy immersed in AS + Brown Indian Hemp tree leaves extract.

4. CONCLUSION

- Corrosion resistance of SS 316 L alloy and SS 18/8 alloy in artificial saliva (AS) in the absence and presence of Brown Indian Hemp tree leaves extract has been investigated by electrochemical study namely, polarization study.
- This study reveals that people having orthodontic wires made of SS 316 L alloy and SS 18/8 alloy should avoid taking Brown Indian Hemp tree leaves extract orally. Because in this medium the corrosion resistance of SS 316 L alloy and SS 18/8 alloy decreases.

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