

Effects of Dissolved Oxygen, Hydrogen, and Temperature
on The Corrosion Potential of Stainless steel

150

(corrosion potential)

가

가 가 가 가

Abstract

In the presence of dissolved oxygen, the corrosion potential of stainless steel in boric acid solution is determined by reduction reaction of dissolved oxygen gas and oxidation of metal. In the case of the absence of dissolved oxygen gas and of the excessive presence of hydrogen gas, we can understand that the corrosion potential of the stainless steel is determined by reduction reaction of H_2O , oxidation of metal, and dissolved hydrogen gas. As the temperature increases, the rate of reaction involved with dissolved oxygen and hydrogen gases speed up due to the increase of activity coefficients of two gases

1.

가

[1].

[1,2].

, pH,

가

가

[3].

가

(corrosion potential)

가

2.

(STS 304,

1.2 cm², 1.3 cm²)

(Ag/AgCl)

(saturated calomel electrode)

)

double junction

(4 % H₂ in Ar)

2000 ppm boron

350 ppm boron

, boron

(H₃BO₃)

. EG&G Model VersaStat

-1.1 V

1.5 V

가

, 5 mV

5 data

3.

1

, 350 ppm boron

가

1

A

가

B

-1.1 V

1.5 V

A

-1.0 V

, -0.5 V

1.4 V

가

B

-0.1 V

()

A

-0.1 V

가

-0.1 V

-0.45

V

2 가 25, 50 80 °C

, 2000ppm boron 가

가 0 V -1.0 V 가 가 ,

가 ()

가

가

3 350 ppm boron 가 ,

가 가 가 -1.0 V

1.0 V 가 ,

가 가 ,

4.

()

가 가 가,

()

가

가

가 가 , 가 가

가 가 가 , 가

가 가

5.

1. "Coolant technology of water cooled reactors: an overview", IAEA Technical report series No. 347, 1993
2. , " ", 1 , KAERI, 1996
3. T. Khan, A. Roecklein, "Status of zinc injection in PWRs", International workshop on implementation of ALARA

at nuclear power plants long island, NY, 1994

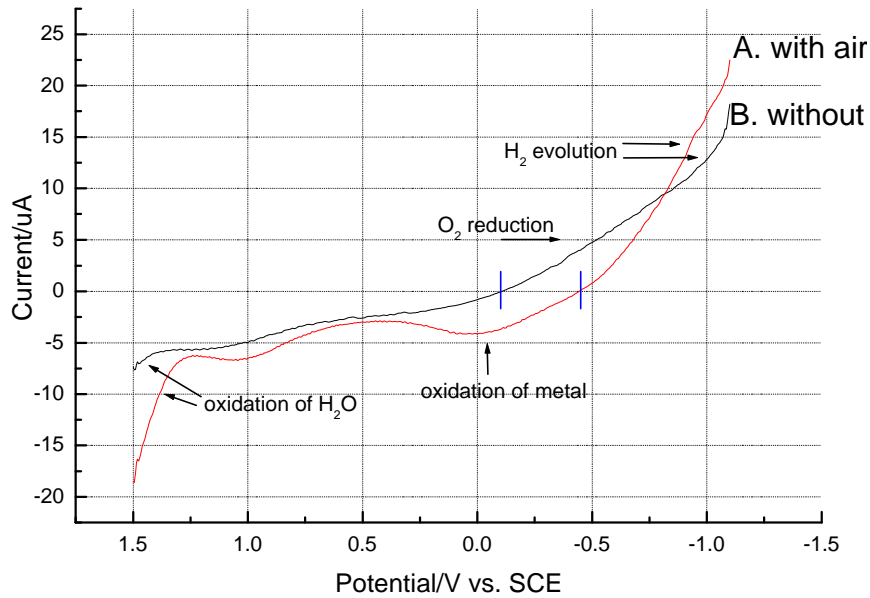


Fig. 1. Potentiostatic polarization curves of stainless steel in 350 ppm boron solution at 25 °C under aerated and deaerated conditions. The exposed area of stainless steel working electrode: 1.2 cm². The count electrode: Pt wire. The reference electrode: saturated calomel electrode.

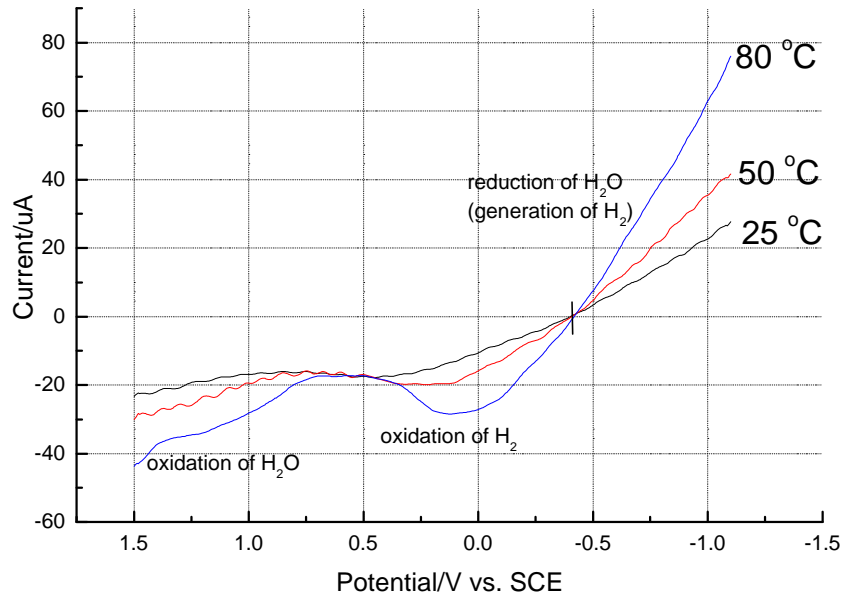


Fig. 2. Potentiostatic polarization curves of Stainless steel in 2000 ppm boron solution in the presence of 4 % H₂ at 25, 50, and 80 °C, respectively. The exposed area of stainless steel working electrode: 1.2 cm². The count electrode: Pt wire. The reference electrode: saturated calomel electrode.

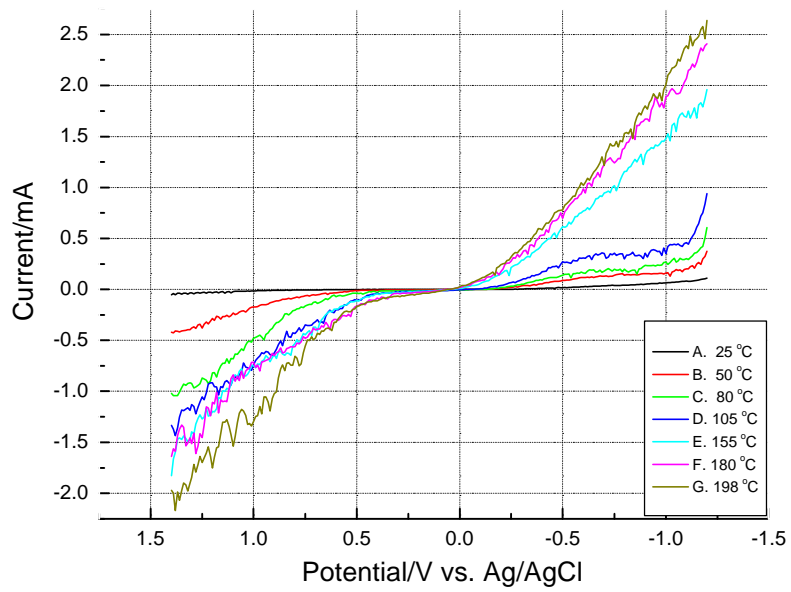


Fig. 3. Potentiostatic polarization curves of Stainless steel in 350 ppm boron solution in the presence of Air at (a) 25, (b) 50, (c) 80, (d) 105, (e) 155, (f) 180, and (g) 198 °C, respectively. The exposed area of stainless steel working electrode: 1.3 cm². The count electrode: Pt wire. The reference electrode: Ag/AgCl