

Name : Miss Sarunya Leelapojsakul  
Thesis Title : Study the Role of Molybdate Anion on Corrosion Resistance of Stainless Steel by Electrochemical Method  
Major Field : Industrial Chemistry  
King Mongkut's Institute of Technology North Bangkok  
Thesis Advisor : Associate Professor Sililuck Nivitchanyong  
Academic Year : 2001

### Abstract

The role of molybdate anion on pitting and crevice corrosion resistance on molybdenum free ferritic stainless steel ANIS 430 and austenitic stainless steel AISI 304 were studied. Molybdate including sodium molybdate dihydrate,  $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$  and ammonium heptamolybdate tetra hydrate,  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$  were introduced to specimens by Immersion Exposure method and Electrochemical method - Potentiodynamic polarization technique and Potentiostatic polarization technique. In immersion exposure, specimens were immersed in 0.1 molar molybdate solutions at  $25^\circ\text{C}$  for 1, 5 and 12 days. Potentiodynamic polarization technique electrolytes were 0.01 to 0.05 M of  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$  and 0.01 to 0.1 M of  $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$  and 0.03 to 0.1 M for both solution in Potentiostatic polarization technique. The corrosion resistance of specimens was investigated in 0.1 M NaCl at  $25^\circ\text{C}$  under  $\text{N}_2$  atmosphere. It was found that 430 stainless steel with  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$  immersion exhibited higher pitting resistance than that of  $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$ . However both solutions did not enhance crevice resistance or repassivation ability. For the 304 stainless steel, specimen with sodium molybdate immersed for 5 days exhibited high pitting resistance. The crevice resistance or repassivation ability would be enhanced if treated with 7 days or more in  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$  under immersion exposure.

Potentiodynamic polarization technique gave 430 stainless steel sample to resist pitting for both solutions. but  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$  coated sample gave repassivation ability. The optimum concentration of molybdate for coating on 430 stainless steel was 0.5 M  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$  solution and  $\geq 0.1$  M  $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$ , while the value for 403 stainless steel was 0.01 M  $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$  and over 0.05 M  $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$ .

TE 131436

Potentiostatic polarization technique coated  $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$  specimens gave higher pitting resistance but not effective for repassivation ability. The optimum condition for 430 stainless steel samples was 0.03M  $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$  with an applied potential of 0.2 V for 1 hr, while the condition on 304 stainless steel was 0.1 M  $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$  with an applied potential of 0.3 volt for 1 hour.

(Total 80 pages)