

Supplementary material

Article

Passive Film Characteristics Formed on Nitrogen-Containing Austenitic Stainless Steel at Different pH and NaCl Concentrations

Jiwoo Byeon ¹, Dongwook Seo ¹ and Seunghyo Lee ^{1,*}

¹ Department of Ocean Advanced Materials Convergence Engineering, Korea Maritime and Ocean University, 727 Taejong-ro, Yeongdo-gu, Busan 49112, Republic of Korea

* Correspondence: lsh@kmou.ac.kr

Table S1. Summary of previous studies on the effect of nitrogen (N) on passive film characteristics and corrosion behavior of austenitic stainless steels.

Study	Material	Environment	Method	Key finding
Gao et al. [1]	HNSS, 316 SS	0.5 mol/L NaCl	▪ Microstructural analysis ▪ Electrochemical tests	▪ Higher N content increases the Cr₂O₃ fraction in passive film, resulting in a lower corrosion rate.
Metikoš-Huković et al. [2]	ASS N25, AISI 316L	Deaerated acidic solution (pH 0.4)	▪ Electrochemical tests	▪ N addition reduces charge carrier density.
Borgioli et al. [3]	Nitrided P558, AISI 202, AISI 316L	5 wt.% NaCl	▪ Microstructural analysis ▪ Electrochemical tests	▪ Passive film stability enhanced in acidic solution. ▪ S phase formation via low-T nitriding enhances hardness and corrosion resistance.
Zagorski et al. [4]	17Cr13Ni2.5Mo (varying N)	1.0M H ₂ SO ₄ , various mixtures of HCl and H ₂ SO ₄ , 1.0M HCl	▪ Electrochemical tests	▪ N addition reduces passivation stability, leading to faster passive film breakdown under increasing Cl⁻ concentration.
P. K. L. Avstenitnih et al. [5]	AISI 316L	3.5 wt.% NaCl, Seawater	▪ Electrochemical tests ▪ XPS analysis	▪ Passive film composition is comparable between 3.5 wt.% and seawater. ▪ However, long-term electrochemical behavior differs due to bio-fouling effects in real seawater.
Wang et al. [6]	HNS	3.5 wt.% NaCl	▪ Microstructural analysis ▪ Electrochemical tests ▪ XPS and SIMS analysis	▪ N enrichment in passive film as CrN suppresses detrimental effect of cold working. ▪ Self-healing repassivation is promoted by N doping in the Cr oxide layer.
Ningshen et al. [7]	Type 316LN (varying N)	0.5 M NaCl, borate buffer and borate buffer + 0.5 M NaCl	▪ Electrochemical tests ▪ XPS analysis	▪ Higher N content reduces N_D and N_A, lowering passive film defect density. ▪ NH₄⁺ formation and reduced hysteresis loop confirm improved pitting resistance in Cl⁻ environment.

References

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