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Corrosion Localized Study in ABNT 310S Stainless Steel Austenitic After Exposition in Salt Spray

J. W. J. Silva[(2)*], R. B. Ribeiro[(1,3)], E. N. Codaro[(2)], and L. R. O. Hein[(2)]

[(1)] Escola de Engenharia de Lorena – Universidade de São Paulo – EEL-USP

[(2)] Campus de Guaratinguetá – Universidade Estadual Paulista – FEG-UNESP email: jwjsilva@yahoo.com.br

[(3)] Faculdades Integradas Teresa D`Ávila – Fatea – Salesianas,

*Corresponding author.

Abstract - This work studies distribution and classification of pits in 310S austenitic stainless steels. 310S as-received state was treated and submitted to salt spray test. Corroded surfaces obtained at different exposition times were captured by an optical microscopic and analysed by digital image processing. Morphological classification of pits was carried out in 310S stainless steel as received and treated. Widh and deep parameters were submitted to statistical analysis. As received condition, exhibited the following morphology: hemispherical pits>transition region A>transition region B> irregular>conic. The pits amount in the treated alloy, in each exposition time, has the same order: transition region B> hemispherical>transition region A>conic>irregular.

The characteristics and pits profiles morphologies in the stainless steel 310S were determined, associating statistical data of position and dispersion, defining size parameters, form description and population, applying public domain programs UTHSCSA IMAGE TOOL 3,0, IMAGE J and Measured Cybernetics Image Pro plus 4.5/Materials - Pro Analyzer 3,1 carried out at LAIMat-DMT-FEG-UNESP. The form description is determined by the Area-Box (AB) defined as ratio between the pit area and the least box that contains the pit, which allows a clear geometric description and quantitative separation of conical, spherical and cylindrical pits among others.

When the alloy is treated, in each exposition time, it presents the same pits quantity order: transition region B > hemispherical > transition region A > conical > irregular. Particularly the pits are deeper than wide. The significant changes in morphologic distribution and in pits size in stainless steel 310S, when treated, are found to be correlated to the chromium carbide precipitated, specifically in quantity and morphology. Through width size medium and pits depth the following order was shown: irregular > conical > transition region A > hemispherical > transition region B. In stainless steel 310S in as-received and treated state, pits growth speed, specifically in width and depth, is different, in which the last seems to be higher and vary with exposition time, therefore, showing to high values in irregular pits and by distribution in great pits amounts in transition region A and B, almost conical and hemispherical.

Table 1 – Medium size and pits relation (depth/width) associated with morphology in Stainless Steel 310S, as received

Time the Exposition [Hours]	Size [medium] μm	Irregular Pits	Conical Pits	Trans A Pits	Hemisph. Pits	Trans B Pits	Cylindrical Pits
48	Width	0	0	4.54	5.53	9.17	0
	Depth	0	0	4.36	4.93	6.33	0
120	Width	19.30	13.70	14.51	10.97	6.38	5.08
	Depth	5.73	4.97	4.99	4.44	4.82	4.72
168	Width	37.78	0	15.41	13.10	6.43	0
	Depth	6.15	0	4.21	3.93	4.59	0
216	Width	13.77	0	5.01	15.41	6.43	0
	Depth	6.16	0	6.72	4.21	4.59	0
312	Width	37.87	8.26	11.62	7.55	5.27	0
	Depth	6.41	6.90	5.08	4.98	5.19	0

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