December 2021

Development of PSPP Map for Stainless Steel Alloys Used in a Marine Environment

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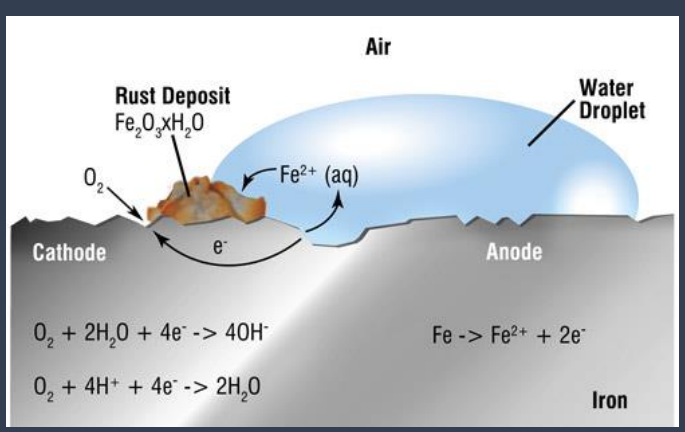
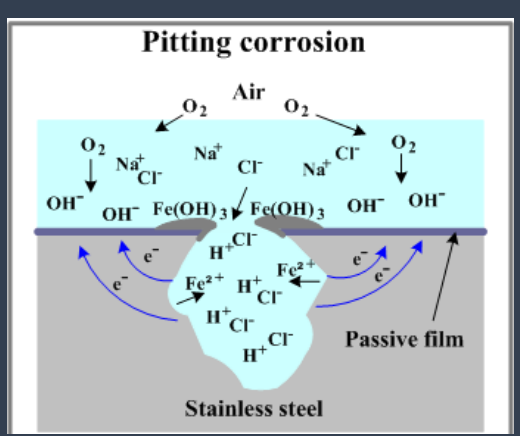
DEVELOPMENT OF PSPP MAP FOR STAINLESS STEEL ALLOYS USED IN A MARINE ENVIRONMENT

What are the root causes of corrosion in a marine environment?

In a marine environment, the dissolved ions in salt water allow electrons to move more freely, resulting in a quickening of the oxidation reaction. The chlorides present in a saltwater environment also cause pitting corrosion for some stainless steels not resistant to chlorides.



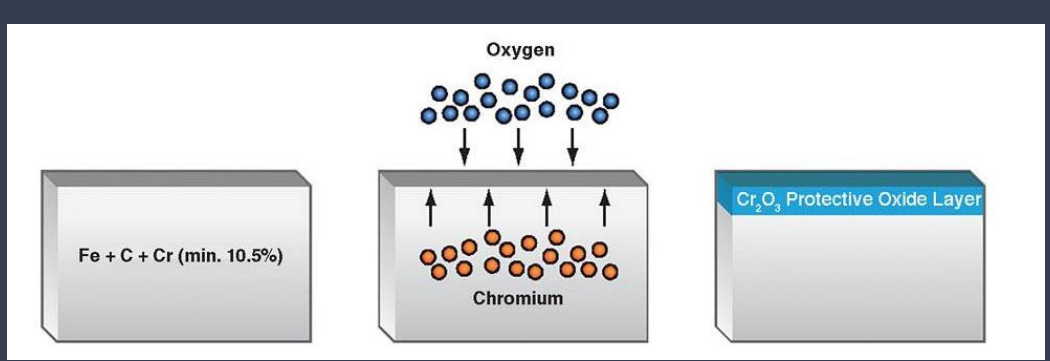
Source: https://www.machinerylubrication.com/read/29116/inhibiting-rust-corrosion



Source: https://www.substech.com/dokuwiki/doku.php?id=pitting_corrosion

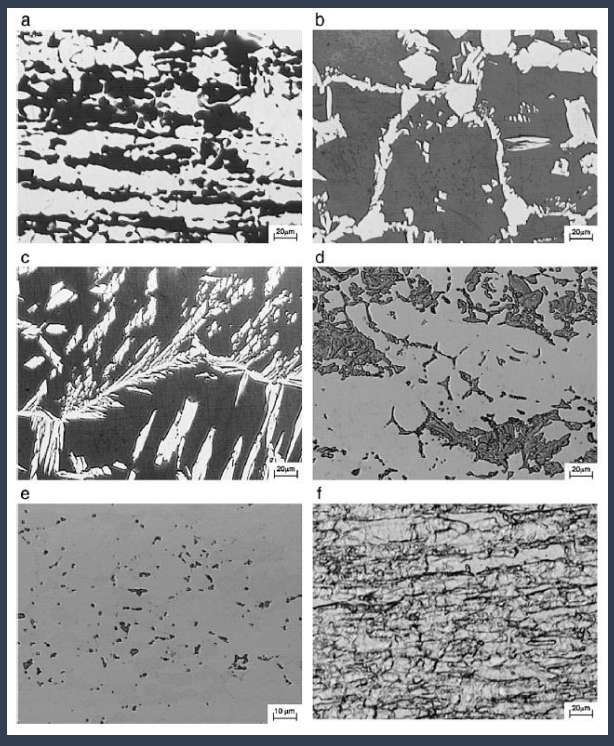
How do stainless steels help to prevent corrosion?

- Minimum 10.5 % Chromium to be considered “stainless”
- Oxygen interacts with the chromium content
- A “passive” layer of chromium oxide protects against corrosion



Source: https://www.thefabricator.com/thefabricator/article/testingmeasuring/passivation-basics-will-this-stainless-steel-rust-#gallery-3

How do stainless steels retain or increase their desirable properties while maintaining or increasing their inherit corrosion resistance?



Source: Moura, V. S., Lima, L. D., Pardal, J. M., Kina, A. Y., Corte, R. R. A., & Tavares, S. S. M. (2008). Influence of microstructure on the corrosion resistance of the duplex stainless steel UNS S31803. *Materials Characterization*, *59*(8), 1127–1132. https://doi.org/10.1016/j.matchar.2007.09.002

- Control of temperature and duration processing controls phase growth and stability
- Alloying elements promote ferrite/austenite phase growth
- Alloying elements may increase strength, toughness, or corrosion resistance
- Impurities and inclusions may impede the effectiveness of the passive layer
- Solution treatment of the material helps promote complete formation of the passive layer

Development of a PSPP map will guide the creation of the material to promote the desired properties and enhance performance.