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Effect of chloride concentration on the corrosion-fatigue crack behavior of an age-hardenable martensitic stainless steel

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Abstract

Crack growth rate and S-N fatigue testing of Custom 465-H950 was performed in 0.0006-3M NaCl with different levels of pre-exposure. Custom 465-H950 exhibited a strong corrosion resistance to various NaCl-based exposures. Concurrent exposure and loading did not result in corrosion damage sufficiently severe to drive crack formation away from microstructure features (TiC particles). The total fatigue life of pre-corroded specimens (pit depth ≈ 40 μm , surface diameter ≈ 175 μm) increased 4-9 fold as [Cl] decreased from 3.0M to 0.0006M. Detailed analysis demonstrated that the varying [Cl] most strongly influenced the initiation life, with secondary contributions from the long- and short-crack propagation regimes.

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