

The Inhibitive Effect of Carbon Containing Corrosion Products Inside Corrosion Pits on the Repassivation of Carbon Steels

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The effect of carbon containing corrosion products within corrosion pits on the repassivation of pits has been studied on 20# and 45# carbon steels in sodium chloride and sodium hydroxide / nitrate / nitrite solutions. Anodic polarisation tests have been carried out in an attempt to cause pitting corrosion and then measure the repassivation potential. The presence of corrosion products within pits has been demonstrated via EDX. Pits in 0.1 M NaNO₂ solutions with different concentrations of NaCl (20 mM, 40 mM, 0.1 M and 0.2 M) have been found to repassivate at different potentials. The repassivation potential of 45# carbon steel is lower than that of 20# when carbon containing corrosion products are detected within corrosion pits, but the difference is negligible when the products are not detected. The presence and absence of carbon containing corrosion products is found to depend on the concentration of chloride. The difference on the repassivation potentials has been ascribed to the inhibitive effect of corrosion products on metal ion diffusion, which may maintain aggressive solution within pits and inhibit repassivation at a low dissolution rate. It has also been found that pits cannot repassivate in NaOH and NaCl solutions, while pitting corrosion cannot take place in NaNO₃ and NaCl solutions.

Keywords: pitting corrosion, repassivation, corrosion products, carbon

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