Oxide Film Properties on an Interstitial-Free Manganese alloyed Steel in Sodium Sulphate Solution

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Components of oxide films on interstitial-free (IF) manganese alloyed steel significantly affect corrosion resistance, and the formation of oxide films and their properties are closely related to the enrichment of alloying elements and the structure of IF manganese alloyed steel. The components and electrochemical properties of oxide films formed on IF manganese alloyed steel were measured by X-ray photoelectron spectroscopy (XPS) and electrochemical tests using 1×10^{-5} mol/L Na_2SO_4 solution as an electrolyte for different annealed samples with Mn content (wt%) from 0.079 to 0.556. The results showed that the corrosion resistance of oxide films generated on IF manganese alloyed steel decreases with Mn enrichment. According to analysis by X-ray diffraction (XRD) and electron backscatter diffraction (EBSD), with augmented Mn content, the crystal-oriented distribution of samples becomes obviously concentrated, and the volume fraction of {111}//ND texture increases. It is confirmed the significant role of the Mn content on grain refinement of IF manganese alloyed steel. In addition, the oxides of other elements (Si and Fe) tend to hold steady with increasing Mn content.

Keywords: IF manganese alloyed steel, oxide film, corrosion resistance, texture, grain orientation

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