Short Communication

Effect of Niobium Micro-Alloying Addition on Electrochemical Corrosion Behavior of Mild Steel in a Highly Alkaline Environment

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Corrosion behavior of niobium (Nb) micro-alloyed steel in a highly alkaline environment were studied by electrochemical method. Electrochemical characterizations such as electrochemical impedance spectroscopy (EIS), potentiodynamic polarization and cyclic voltammetry (CV) were utilized to consider the Nb addition effect on corrosion resistance of mild steel. The current value decreased to zero potential with the increase of the Nb content in CV curves, which means that the addition of Nb facilitates the formation of stable passive film. The polarization results indicated that the mild steel with 0.03 wt% Nb was in the passive region during the exposure time and had a smaller current than that of other samples. The EIS results indicated that the double-layer capacitance value reduced with the increase of Nb content which revealed that the passive film thickness had increased and resulted in the enhancement of the protective capacity when the Nb content of microalloyed steel was gradually increased. Scanning electron microscopy images indicated that the surface of the steel (0.03 wt% Nb) was clean and smooth without any visible corrosion zones, which means that the sample had a suitable corrosion resistance even in an aggressive environment.

Keywords: Mild steel; Corrosion behavior; Electrochemical characterizations; Alkaline environment

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