Short Communication

Corrosion Behavior of 9 % Ni Steel for LNG Storage Tanks in 3.5 wt. % NaCl Solution

Ming Qin^{1,2}, Weichen Xu^{1,3}, Lihui Yang^{1,3}, Yantao Li^{1,3,*}

¹ CAS Key Laboratory of Marine Environmental Corrosion and Bio-fouling, Institute of Oceanology, Chinese Academy of Sciences, Qingdao 266071, China.

² University of Chinese Academy of Sciences, Beijing 100049, China.

³ Open studio for marine Corrosion and Protection, Qingdao National Laboratory for Marine Science and Technology, Qingdao 266071, China.

*E-mail: ytli@qdio.ac.cn

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The corrosion behavior of 9 % Ni steel in a 3.5 wt. % NaCl solution was investigated by electrochemical techniques including open circuit potential (OCP), potentiodynamic polarization, and electrochemical impedance spectroscopy (EIS). The principal components and morphology of 9 % Ni steel and the resulting corrosion layer are analysed by metallographic evaluation, scanning electron microscopy (SEM), energy-dispersive spectroscopy (EDS), Raman spectroscopy, X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR). The results suggest that the anodic reaction is primarily the dissolution of the iron matrix and the cathodic process is mainly the reduction of oxygen. The corrosion resistance R_{ct} of 9 % Ni steel decreased with increasing immersion time and the corrosion layer did not provide protection. The outer section of the corrosion product consists mostly of lepidocrocite γ -FeOOH, trace goethite α -FeOOH, and magnetite Fe_3O_4 . The inner section is a nickel-rich layer, which is related to the alloying elements and reverted austenite. Moreover, the corrosion layer was found to accelerate the selective corrosion.

Keywords: 9 % Ni steel; corrosion; electrochemical tests; reverted austenite; nickel-rich layer

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