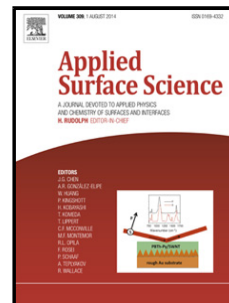


Accepted Manuscript

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PII: S0169-4332(14)01261-6
DOI: <http://dx.doi.org/doi:10.1016/j.apsusc.2014.06.003>
Reference: APSUSC 28039

To appear in: *APSUSC*

Received date: 1-4-2014
Revised date: 1-6-2014
Accepted date: 1-6-2014

Please cite this article as: S.J. Kim, H.G. Jung, G.T. Park, K.Y. Kim, Effect of Cu and Ni on Sulfide Film Formation and Corrosion Behavior of Pressure Vessel Steel in Acid Sour Environment, *Applied Surface Science* (2014), <http://dx.doi.org/10.1016/j.apsusc.2014.06.003>

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Effect of Cu and Ni on Sulfide Film Formation and Corrosion Behavior of Pressure Vessel Steel in Acid Sour Environment

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Abstract:

The corrosion behavior of pressure vessel steel in acid sour environment is investigated in terms of the characteristic of iron sulfide film formed on the steel surface. The corrosion properties are evaluated by means of the potentiodynamic (PD) polarization, long-term potentiostatic polarization, linear polarization resistance (LPR) and electrochemical impedance spectroscopy (EIS). For the fundamental and mechanistic study on the corrosion behavior and the scale forming process, the change in anodic and cathodic component of the corrosion reaction is separately analyzed. For this, the numerical curve-fitting with Wagner-Traud equation to the PD polarization data is employed and various kinetic parameters are determined quantitatively. This study clearly reveals that the sulfide film formed on the surface of Cu and Ni bearing steel has smaller cracks than that on the steel containing only smaller Ni. Smaller cracks in the sulfide film suppress effectively anodic dissolution, hydrogen reduction and hydrogen diffusion through the steel, resulting in lower corrosion rate and higher resistance to hydrogen induced cracking.

Keywords: Pressure vessel steel, Corrosion, Iron sulfide, Sour environment, Polarization test, Hydrogen induced cracking

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