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PII: S0921-5093(16)31097-8  
DOI: <http://dx.doi.org/10.1016/j.msea.2016.09.033>  
Reference: MSA34118

To appear in: *Materials Science & Engineering A*

Received date: 25 May 2016  
Revised date: 5 September 2016  
Accepted date: 10 September 2016

Cite this article as: Zhongyu cui, Zhiyong liu, Liwei Wang, Xiaogang Li, Cuiwei Du and Xin Wang, Effect of plastic deformation on the electrochemical and stress corrosion cracking behavior of X70 steel in near-neutral pH environment *Materials Science & Engineering A* <http://dx.doi.org/10.1016/j.msea.2016.09.033>

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# Effect of plastic deformation on the electrochemical and stress corrosion cracking behavior of X70 steel in near-neutral pH environment

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**Abstract:** This work investigated the effect of plastic deformation on the electrochemical and stress corrosion cracking (SCC) behavior of X70 steel in near-neutral pH environment. The deformation-induced increase in electrochemical activity, dislocation density and heterogeneity, and surface roughness accelerated the corrosion, especially the cathodic reactions. Hydrogen absorption and permeation into the steel is promoted by the plastic deformation, resulting in the high hydrogen content of the pre-deformed steels. Moreover, the SCC susceptibility increases with plastic elongation, which is attributed to the enhanced anodic dissolution and hydrogen absorption.

**Key words:** pipeline steel; plastic deformation; electrochemical; hydrogen absorption; stress corrosion cracking

## 1. Introduction

Stress corrosion cracking (SCC) of steels in near-neutral pH environment has been a vital threat to the safe operation of buried oil/gas pipelines [1, 2]. The high strain caused by soil settlement, ground movement, bending over an unsupported span, and seismic loading are generated on the pipelines during service. The plastic

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