Mechano-electrochemical interaction of high-strength pipeline steels with Al-Ti deoxidization and Mg-Ca compound treatment

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Abstract The micro-zone interface of inclusions with the steel matrix of X70 high-strength pipeline steel with Al-Ti deoxidization and Mg-Ca compound treatment in the tropical marine environment was investigated. Results revealed that the Volta potential difference increased in proportion to the residual stress at the interface of inclusions with the steel matrix. The early corrosion behavior of pipeline steel was investigated by immersion testing and corrosion morphology assessment. Three stages of the early corrosion process of pipeline steel were elucidated based on micro mechano-electrochemical (M-E) interaction. Thermodynamic and kinetic models of M-E interactions at the micro-scale were proposed.

Keywords: X70 Steel; High-strength acid-resistant steel; Mg-Ca compound treatment; Micro-zone interface; Corrosion; Tropical marine environment

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