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Study on Hydrogen Embrittlement of High-Strength Steels under Wet-Dry Corrosion Environments

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Summary

Recently, high-strength steels have been utilized in many engineering fields as one of the measures against global warming. However, since high-strength steels are generally susceptible to hydrogen embrittlement, many researchers have been focused on hydrogen-dislocation interactions in relation to hydrogen embrittlement of high-strength steels. In addition, hydrogen atoms can be absorbed into high-strength steels due to steel corrosion under atmospheric environments. In this study, hydrogen-dislocation interactions were investigated by measuring stress relaxation of high-strength steels under corrosion environments. It was confirmed from the results of hydrogen permeation experiments that hydrogen atoms were absorbed into the high-strength steels during immersion tests and wet-dry cyclic tests. Further, it was found that entry of hydrogen atoms into the steels can induce larger amount of stress relaxation and higher stress relation rates than those measured in air. By analyzing the stress relaxation curves for the hydrogen-absorbed steels, it was speculated that the larger amount of stress relaxation and higher stress relation rates observed for the hydrogen-absorbed steels can be due to enhancement of mobile dislocation density into the steels.