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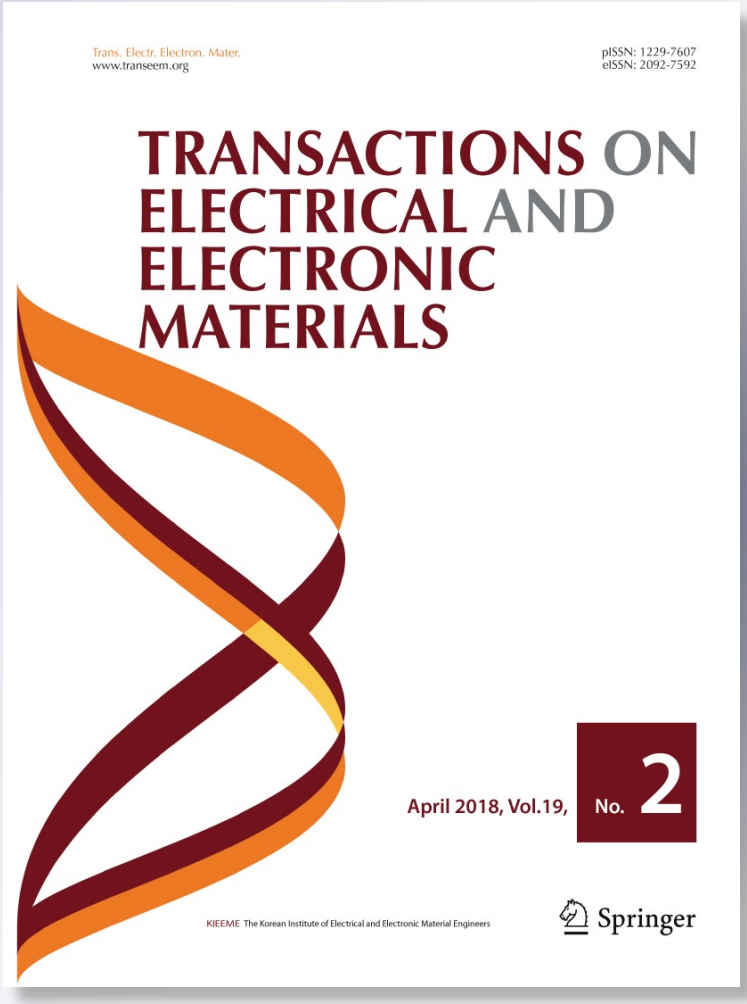
Transactions on Electrical and Electronic Materials

ISSN 1229-7607
Volume 19
Number 2

Trans. Electr. Electron. Mater. (2018)
19:134-145
DOI 10.1007/s42341-018-0022-z



Springer

Transactions on Electrical and Electronic Materials (2018) 19:134–145
https://doi.org/10.1007/s42341-018-0022-z

Online ISSN 2092-7592
Print ISSN 1229-7607

REGULAR PAPER

Experimental and Numerical Investigations of Effect of Alternating Current Interference Corrosion on Neighboring Pipelines

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Received: 14 November 2017 / Revised: 7 December 2017 / Accepted: 7 December 2017 / Published online: 6 March 2018

Abstract
High-voltage (HV) power lines sometimes share the same path as buried pipelines that are protected by an insulation coating and cathodic protection (CP). However, the neighboring HV power lines induce an alternating current (AC) that causes corrosion damage to metallic structures, which is known as the AC corrosion phenomenon. In this study, we conducted an experimental investigation on a laboratory model to realize electrochemical tests on a pipeline steel sample. Afterward, we performed numerical simulation studies of the electrochemical reactions involved in the corrosion, such as the anodic and cathodic processes, i.e., the iron oxidation and reduction of both oxygen and hydrogen. We also simulated the CP, AC corrosion, and deformation of the steel pipeline sample. Finally, to remedy the problem of AC corrosion damage, we developed a monitoring and correction program to optimize it. The main novelty of our work resides in our experimental and numerical simulation results, which were in good agreement, along with the development of the program for the automatic mitigation of AC corrosion.

Keywords AC interference · AC corrosion · Cathodic protection · Electrochemical tests

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