Experimental Data Treatment of the Pipeline Steel Polarization Curve under AC Interference

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The treatment of polarization curves of pipeline steels subject to AC (Alternating Current) was studied. The Tafel exploration, the non-linear curve fitting method, and the SYMADEC (synthesis, matching, and deconvolution of polarization curves) algorithm were used to evaluate the Tafel slopes and the corrosion current density from a set of experimental polarization curves. The results of the Tafel exploration show a large variation when different linear portions were selected for the calculation. The non-linear curve fitting method is sensitive to noise and easy to fail when used to fit planarization data presenting AC signal. SYMADEC is a robust method to fit the experimental polarization curves, which do not present a Tafel region. Moreover, the results of SYMADEC can be deconstructed into the anodic and cathodic components providing more kinetics information about the electrode process. Therefore, in the study of the AC corrosion behavior by polarization curves exhibiting no Tafel region, the experimental data should be carefully treated to obtain accurate values of the kinetics parameters. The use of SYMADEC is recommended in this case.

Keywords: polarization curve; Tafel slope; corrosion current; AC corrosion

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