Int. J. Electrochem. Sci., 16 **(2021)** Article ID: 210925, doi: 10.20964/2021.09.31

International Journal of
ELECTROCHEMICAL
SCIENCE
www.electrochemsci.org

The Electrochemical Corrosion Behaviour of Q235 Steel in Soil Containing Sodium Chloride

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Received: 21 May 2021 / *Accepted:* 11 July 2021 / *Published:* 10 August 2021

In this paper, the silt soil in Shanxi, China was selected and sodium chloride solution was added to the soil as the simulated saline soil. The corrosion characteristics of four contaminated soils with various sodium chloride contents were analysed by electrochemical impedance spectroscopy (EIS), and the electrochemical corrosion behaviour of Q235 steel at three ages in these four different simulated saline soil environments was studied by using EIS and polarization curves. The corrosion mechanism was analysed by scanning electron microscopy (SEM). The test results showed that the soil with a sodium chloride content of 2.3% had the strongest electrical conductivity. The increase in the sodium chloride content in the soil promoted not only the conductivity and corrosiveness of the soil but also the corrosion rate of Q235 steel. By fitting the electrochemical impedance spectra of steel, two equivalent circuits of R(CR(QR))(CR) and LR(QR)(QR) were obtained, and the total impedance formulas were deduced. By analysing the parameters of the equivalent circuit, the corrosion process of Q235 steel was determined. The corrosion area on the surface of the Q235 steel specimen continued to expand, and the degree of corrosion deepened with increasing sodium chloride concentration in the soil.

Keywords: corrosion, contaminated soil, electrochemical impedance spectroscopy, mechanism, polarization curve, Q235 steel

FULL TEXT