Corrosion behavior of tinplate in NaCl solution under different temperature

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The corrosion behavior of tinplate in 0.1 mol/L NaCl solution under different temperature was investigated by using polarization curve, electrochemical impedance spectroscopy (EIS) and immersion tests, and the morphology of corroded tinplate was observed by stereoscopic digital microscopy and scanning electron microscopy. The dissolution content of Fe and Sn elements in NaCl solution was determined by inductively coupled plasma mass spectrometry. The results showed that the corrosion of tinplate in NaCl solution is characterized with two time constant in EIS spectrum, and the radius of capacitance arc is firstly decreased and then slightly raised with the extension of immersion time. With the increasing of temperature from 5 °C to 37 °C, tinplate has a higher corrosion current density, lower radius of capacitance arc and higher dissolution rate in NaCl solution. The activation energy of tin coating is less than that of steel substrate at the initial immersion, but afterward increased to a higher value and larger than that of steel. The corrosion process of tinplate in NaCl solution is divided into four stages, and the corrosion mechanism of every stage is proposed.

Keywords: tinplate, corrosion behavior, NaCl solution, temperature, degradation process

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