Electrochemical Behavior and Corrosion Products of Casing Steel under CO₂ Condition

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The anodic reaction of CO₂ corrosion of steel is closely related to the formation and characteristics of the corrosion product film. However, the relationship between the anodic reaction and the corrosion product film has not been studied. As a useful tool to study the dynamic process of the electrode and the electrode surface state, the measurement technique of AC impedance has been gradually used to study the characteristics of the CO₂ corrosion product film along with evaluating corrosion inhibitors and ion adsorption on the electrode surface of casing steel. In this work, the AC impedance characteristics of N80 steel in different media environments were studied using. The influence of the electrode reaction and corrosion product film on the AC impedance spectrum is analyzed, and a theoretical model of CO₂ corrosion is proposed. This model is used to study the influence of temperature and Cl⁻ concentration on the impedance spectrum of the cathode and anode of N80 casing steel, to explore the film formation on the surface of the sample and the electrode reaction process and to understand the impact of environmental factors on CO₂ corrosion.

Keywords: Corrosion; Corrosion products; Carbon dioxide; Casing steel; Electrochemical polarization

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