Abstract :

In this work, we investigated the influence of galvanizing immersion time and cooling modes environments on the electrochemical corrosion behavior of hot-dip galvanized steel, in 1 M sulfuric acid electrolyte at room temperature using potentiodynamic polarization technique. In addition, the evolution of thickness, structure and microstructure of zinc coatings for different immersion times and two cooling modes (air and water) is characterized, respectively, by using of Elcometer scan probe, x-ray diffraction and metallography analysis. The analysis of the behavior of steel and galvanized steel, vis-a-vis corrosion, by means of corrosion characteristic parameters as anodic (β_a) and cathodic (β_c) Tafel slopes, corrosion potential (E_{corr}), corrosion current density (i_{corr}), corrosion rate (CR) and polarization resistance (R_p), reveals that the galvanized steel has anticorrosion properties much better than that of steel. More the immersion time increases, more the zinc coatings thickness increases, and more these properties become better. The comparison between the two cooling modes shows that the coatings of zinc produced by hot-dip galvanization and air-cooled provides a much better protection to steel against corrosion than those cooled by quenching in water which exhibit a brittle corrosive behavior due to the presence of cracks.