Corrosion Behavior of Bismuth in Concentrated Sulphuric Acid Solution and Stability of its Surface Oxide Film

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The surface activity of bismuth (Bi) was investigated in 4.97 M H₂SO₄ solution using cyclic voltammetry (CV), potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) measurements. The CV results indicated that the current plateau values increase as the scan rate increases. This may be caused by the high ionic character of the protective film formed on Bi surface. From the EIS results it was found that the thickness of each of the pre-immersion oxide and the anodically formed film on Bi decreases with increasing of the immersion time due to their dissolution in the acid medium. Polarization scans showed that the rate of corrosion of Bi in the acid solution rises as the polarization temperature increases. The values of the thermodynamic parameters E_a (activation energy), ΔH (enthalpy change) and ΔS (entropy change) of the corrosion process for Bi in the concentrated sulphuric acid solution were estimated. The surface of bismuth was demonstrated under scanning electron microscopy (SEM) after polishing and polarization in sulphuric acid as well as at the end of the EIS measurements (at 70 min).

Keywords: Bismuth; cyclic voltammetry; EIS; polarization; SEM

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