THE INFLUENCE OF A MAGNETIC FIELD ON THE ELECTROCHEMICAL REST POTENTIAL

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The shift in rest potential of an iron electrode in a magnetic field is an effect that has been known for over 100 years, but it has never been satisfactorily explained. The influence of an external magnetic field on the rest potential E_0 of ferromagnetic and nonferromagnetic electrodes has been studied in a wide range of conditions n order to try to understand the origin of the effect; the shift. ΔE_0 is measured as a function of magnetic field magnitude and direction, pH, electrolyte composition, solution agitation and electrode roughness. Anodic shifts can be observed for ferromagnetic electrodes (iron, cobalt, nickel), but also for nonmagnetic electrodes (zinc, manganese). The essential condition to observe the shift is that the electrode should be *actively corroding*. An anodic shift is observed when the cathodic corrosion current is mass transport limited. The primary mechanism for the effect is agitation of the electrolyte near the electrode surface due to Lorentz force acting on the corrosion currents directly, or via the electrokinetic effect. A smaller influence of magnetic field gradient produced by ferromagnetic electrodes is identified, but the action of the magnetic field on the concentration gradient of paramagnetic ions in the electrolyte plays no role.