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-- البحث الاول

Effect of Al content on the corrosion behavior of Mg–Al alloys in aqueous solutions of different pH

- Ghada M. Abady[b],
- Nadia H. Hilal[b],
- Mohmmed El-Rabiee[b],
- Waheed A. Badawy[a,]

- [a] Chemistry Department, Faculty of Science, University of Cairo, 12613 Giza, Egypt
- [b] Chemistry Department, Faculty of Science, Fayoum University, Fayoum, Egypt

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Abstract

The effect of systematic increase of Al content on the electrochemical behavior of the Mg–Al alloys in aqueous solutions of different pH was investigated. Different electrochemical methods such as open-circuit potential measurements, polarization techniques and electrochemical impedance spectroscopy, EIS, were used to investigate the electrochemical behavior of the alloys in aqueous solutions. The results have shown that Mg–5Al is easily corroded due to the microgalvanic effect between α-phase and β-phase, its corrosion rate is even higher than that of Mg itself. The increase of Al content increases the corrosion resistance of the alloy due to the formation of the β-phase ($Mg_{17}Al_{12}$) together with the Mg α-phase. The ranking of the corrosion rate of these alloys was Mg–5Al > Mg > Mg–

10Al ≅ Mg–15Al. The corrosion rates of the alloys in acidic solutions are pronouncedly high compared to those measured in neutral or basic solutions. The impedance measurements are in consistence with the polarization techniques and the impedance data were fitted to theoretical data obtained according to an equivalent circuit model describing the electrode/electrolyte interface.

البحث الثانى

Environmentally safe corrosion inhibition of Pb in aqueous solutions

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- N.H. Helal[b],
- M.M. El-Rabiee[b],
- Gh.M. Abd El-Hafez[b],
- W.A. Badawy[a,]

- [a] Chemistry Department, Faculty of Science, Cairo University, Giza, Egypt
- [b] Chemistry Department, Faculty of Science, Fayoum University, Fayoum, Egypt

- Abstract
- The corrosion and corrosion inhibition of lead in aqueous solutions with different pHs (2, 7 and 12) were investigated. The corrosion rate was calculated in the absence and presence of the corrosion inhibitor using polarization and impedance techniques. Amino acids have been used as environmentally safe corrosion inhibitors. The inhibition efficiency of the different amino acids at a concentration of 0.025 M was calculated. Corrosion inhibition efficiency up to 87% was recorded with glutamic acid in neutral solutions. The experimental impedance data were fitted to theoretical values according to an equivalent circuit model to explain the behavior of the metal under different conditions. The corrosion inhibition process was found to depend on the adsorption of the amino acid molecules on the metal surface; and the adsorption free energy in each case was calculated. The free energy of adsorption of glutamic acid on Pb was found to be equal to −2.9 kJ/mol, which reveals that the inhibitor is physically adsorbed on the metal surface. The results are obeying Langmuir adsorption isotherm.

البحث الثالث

Corrosion control of vanadium in aqueous solutions by amino acids

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- M.M. El-Rabiee[b],
- N.H. Helal[b],
- Gh.M. Abd El-Hafez[b],
- W.A. Badawy[a],

- [a] Chemistry Department, Faculty of Science, Cairo University, Giza, Egypt
- [b] Chemistry Department, Faculty of Science, Fayoum University, Fayoum, Egypt

- Abstract

- The electrochemical behavior of vanadium in amino acid free and amino acid containing aqueous solutions of different pH was studied using open-circuit potential measurements, polarization techniques and electrochemical impedance spectroscopy (EIS). The corrosion current density, i_{corr}, the corrosion potential, E_{corr} and the corrosion resistance, R_{corr}, were calculated. A group of amino acids, namely, glycine, alanine, valine, histidine, glutamic and cysteine has been investigated as environmentally safe inhibitors. The effect of Cl^- on the corrosion inhibition efficiency especially in acid solutions was investigated. In neutral and basic solutions, the presence of amino acids increases the corrosion resistance of the metal.
- The electrochemical behavior of V before and after the corrosion inhibition process has shown that some amino acids like glutamic acid and histidine have promising corrosion inhibition efficiency at low concentration (≅25 mM). The inhibition efficiency (η) was found to depend on the structure of the amino acid and the constituents of the corrosive medium. The corrosion inhibition process is based on the adsorption of the amino acid molecules on the metal surface and the adsorption process follows the Freundlich isotherm. The adsorption free energy for valine on V in acidic solutions was found to be −9.4 kJ/mol which reveals strong physical adsorption of the amino acid molecules on the vanadium surface.