

Figure 1 – Mitochondrial metabolic activity of cells exposed to CP-Mg and AZ31, AZ91 and ZK60 alloys for 24 hours compared to control groups.



Figure 2 – Live/dead assay of cells exposed to CP-Mg and AZ31, AZ91 and ZK60 alloys for 24 hours.



Figure 3 – Potentiodynamic polarization curves of CP-Mg and AZ31, AZ91 and ZK60 alloys before and after HPT processing.



Figure 4 – Surface features after polarization tests of CP-Mg and AZ31, AZ91 and ZK60 alloys before and after HPT processing.



Figure 5 – Electrochemical impedance spectroscopy curves of CP-Mg and AZ31, AZ91 and ZK60 alloys before and after HPT processing.



Figure 6 – Equivalent circuits used to model the electrochemical impedance spectroscopy curves.



Figure 7 – Surface features after Electrochemical impedance spectroscopy tests of CP-Mg and AZ31, AZ91 and ZK60 alloys before and after HPT processing.

 

Figure 8 – Mass loss rate as a function of time of CP-Mg and AZ31, AZ91 and ZK60 alloys before and after HPT processing.



Figure 9 – Macroscopic appearance of samples of CP-Mg and AZ31, AZ91 and ZK60 alloys, before and after HPT processing, after immersion in Hank´s solution



Figure 10 – Low magnification images of localized corrosion of samples of CP-Mg and AZ31, AZ91 and ZK60 alloys, before and after HPT processing, after immersion in Hank´s solution for 28 days.

Tables

Table 1: Composition of Hank´s solution.

|  |  |
| --- | --- |
| Chemical compost | Concentration (g.L-1) |
| NaCl | 8 |
| KCl | 0.4 |
| MgSO4.7H2O | 0.06 |
| MgCl2.6H2O | 0.1 |
| CaCl2 | 0.14 |
| Na2HPO4.2H2O | 0.06 |
| KH2PO4 | 0.06 |
| Glucose | 0.1 |
| NaHCO3 | 0.35 |

Table 2: Summary of data for corrosion potential (ECorr), corrosion current (ICorr), penetration rate calculated from the corrosion current (Pi), pitting potential (EPit), passivation current (IPass) and passivation potential range (EPit - ECorr) determined from the polarization tests.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Material and condition | | ECorr  (VAg/AgCl) | iCorr  (μA.cm-2) | Pi  (mm.y-1) | EPit  (VAg/AgCl) | iPass  (μA.cm-2) | EPit - ECorr  (VAg/AgCl) |
| CP-Mg | As-cast | -1.60 ± 0.01 | 0.20 ± 0.02 | 0.025 ± 0.003 | - 1.37 ± 0.01 | 29 ± 1 | 0.23 ± 0.02 |
| CP-Mg | HPT | -1.59 ± 0.02 | 0.25 ± 0.06 | 0.034 ± 0.007 | -1.42 ± 0.01 | 15 ± 1 | 0.17 ± 0.03 |
| AZ31 | Ext. | -1.45 ± 0.03 | 0.14 ± 0.01 | 0.017 ± 0.001 | -1.33 ± 0.01 | 6.9 ± 0.3 | 0.12 ± 0.04 |
| AZ31 | HPT | -1.46 ± 0.03 | 0.16 ± 0.04 | 0.022 ± 0.005 | -1.33 ± 0.01 | 9.2 ± 0.8 | 0.13 ± 0.04 |
| AZ91 | S.T. | -1.56 ± 0.01 | 0.06 ± 0.02 | 0.009 ± 0.001 | -1.41 ± 0.01 | 6.7 ± 0.1 | 0.15 ± 0.03 |
| AZ91 | HPT | -1.57 ± 0.02 | 0.14 ± 0.01 | 0.019 ± 0.004 | -1.43 ± 0.01 | 7.9 ± 0.7 | 0.14 ± 0.03 |
| ZK60 | Ext. | -1.46 ± 0.04 | 2.3 ± 0.7 | 0.22 ± 0.08 | ------- | ------- | ------- |
| ZK60 | HPT | -1.37 ± 0.01 | 0.26 ± 0.07 | 0.036 ± 0.008 | ------- | ------- | ------- |

Table 3: Summary of data for the equivalent circuits used to model the EIS curves.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Mg  As-cast | Mg  HPT | AZ31  Ext. | AZ31  HPT | AZ91  S.T. | AZ91  HPT | ZK60  Ext. | ZK60  HPT |
| R1(Ω.cm2) | 7.8 | 10 | 16.7 | 13 | 16.2 | 17.2 | 16.8 | 21.6 |
| R2(kΩ.cm2) | 0.171 | 0.234 | 0.059 | 0.075 | 0.016 | 0.014 | 0.039 | 0.053 |
| CPE1(µF.cm-2) | 1063 | 3 | 492 | 748 | 788 | 1043 | 1305 | 1309 |
| n | 0.33 | 0.32 | 0.49 | 0.40 | 0.49 | 0.52 | 0.37 | 0.44 |
| R3(KΩ.cm2) | 0.805 | 1.620 | 0.143 | 2.736 | 5.693 | 5.300 | 0.187 | 0.173 |
| CPE2(µF.cm-2) | 318 | 293 | 330 | 287 | 249 | 294 | 174 | 4272 |
| n | 0.99 | 0.98 | 0.99 | 0.96 | 0.83 | 0.82 | 0.80 | 0.99 |
| R4(KΩ.cm2) | 1.692 | 3.149 | 0.618 | 5.881 | 8.427 | 8.472 | 0.224 | 0.371 |
| Rp(kΩ.cm2) | 2.668 | 5.003 | 0.821 | 8.692 | 14.136 | 13.790 | 0.450 | 0.595 |
| CPE3(µF.cm-2) | 52 | 46 | 20 | 23 | 26 | 27 | 130 | 55 |
| n | 0.87 | 0.87 | 0.97 | 0.91 | 0.91 | 0.91 | 0.99 | 0.94 |
| L (kΩ∙s∙cm2) | - | - | 3 |  | - | - | 7 | 7 |