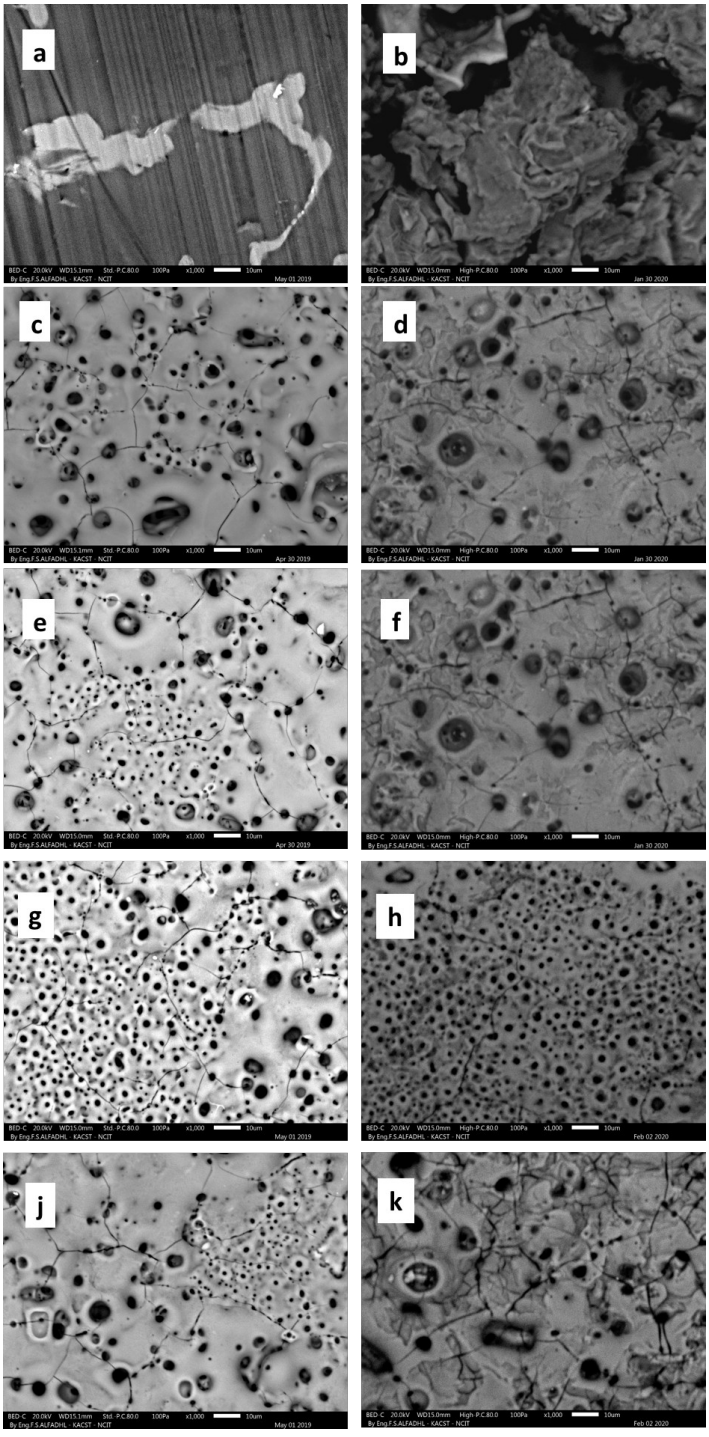
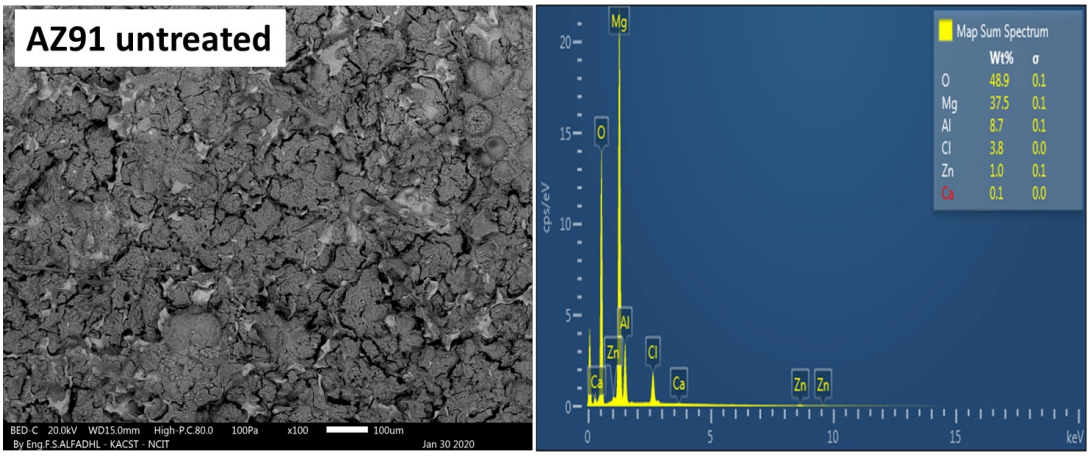
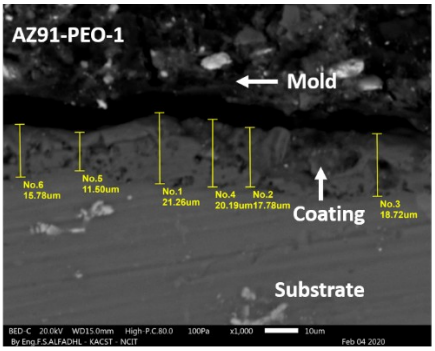
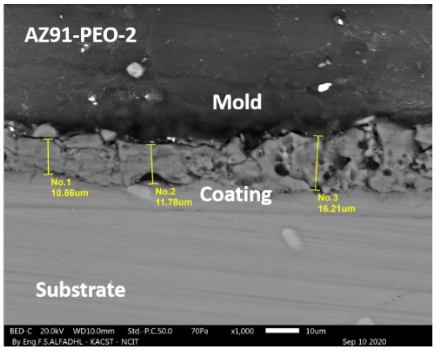
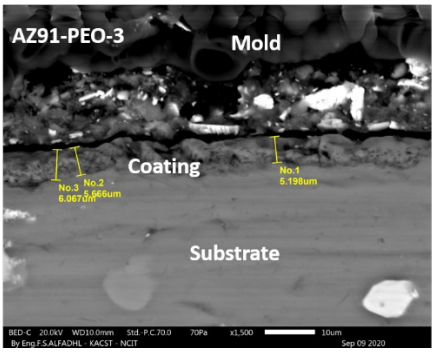
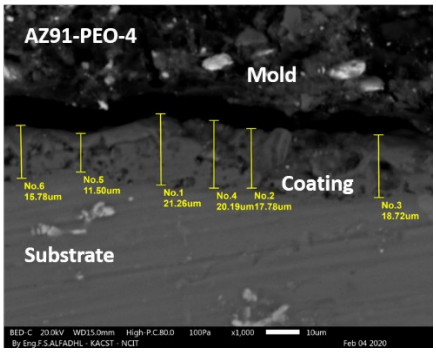

a
b
c
d
e
f
g
h
j
k

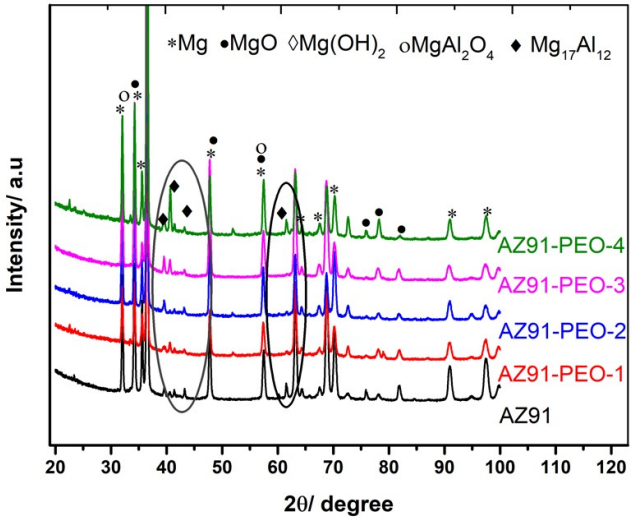

AZ91 untreated
BED-C 20.0kV WD15.0mm High-P.C.80.0 100Pa x100 100um
By Eng.F.S.ALFADHL - KACST - NCIT Jan 30 2020
Mg
O
Al
Zn
Cl
Ca
Ca
Zn
Zn
cps/eV
keV
Map Sum Spectrum
Wt% σ
O 48.9 0.1
Mg 37.5 0.1
Al 8.7 0.1
Cl 3.8 0.0
Zn 1.0 0.1
Ca 0.1 0.0

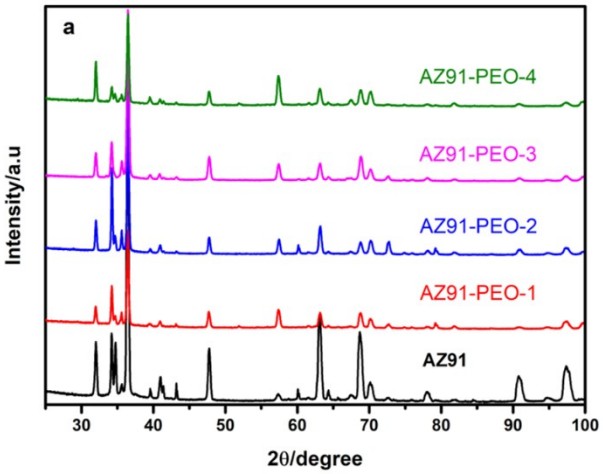

AZ91-PEO-1
Mold
No.6 16.78um
No.5 11.50um
No.1 21.26um
No.4 20.19um
No.2 17.78um
Coating
No.3 18.72um
Substrate
BED-C 20.0kV WD15.0mm High-P.C.80.0 100Pa x1,000 10um
By Eng.F.S.ALFADHL - KACST - NCIT Feb 04 2020

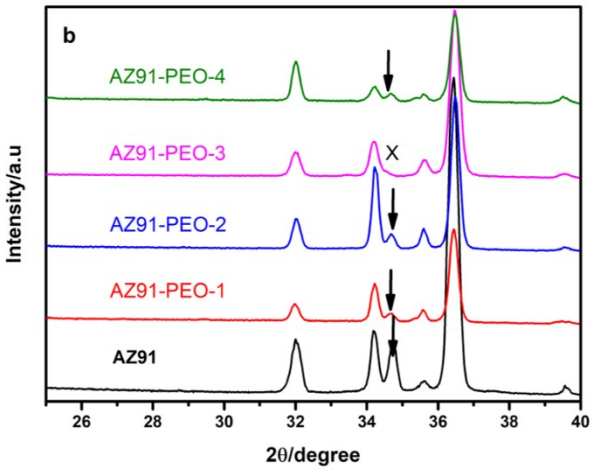

AZ91-PEO-2
Mold
No.1 10.66um
No.2 11.78um
Coating
No.3 16.21um
Substrate
BED-C 20.0kV WD10.0mm Std.-P.C.50.0 70Pa x1,000 10um
By Eng.F.S.ALFADHL - KACST - NCIT Sep 10 2020

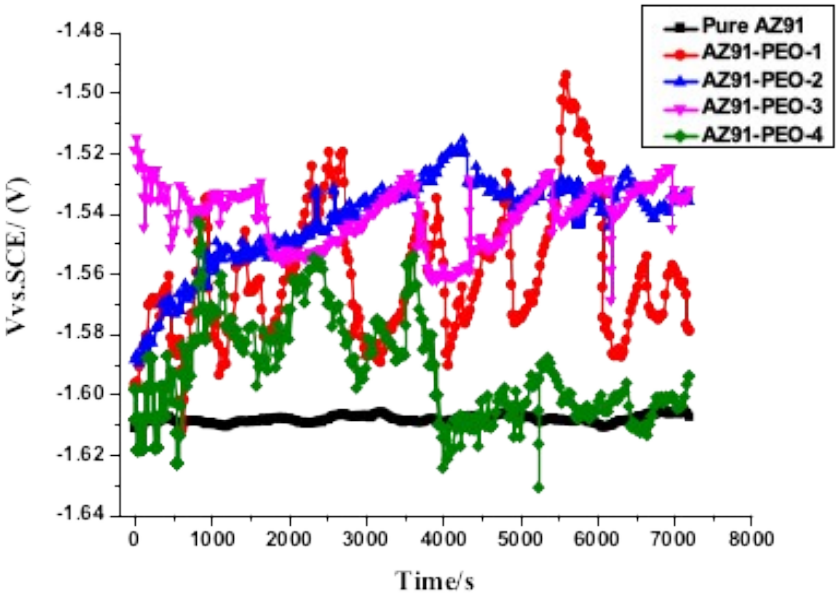

AZ91-PEO-3
Mold
Coating
No.3 6.067um
No.2 5.966um
No.1 5.198um
Substrate
BED-C 20.0kV WD10.0mm Std.-P.C.70.0 70Pa x1,500 10um
By Eng.F.S.ALFADHL - KACST - NCIT Sep 09 2020

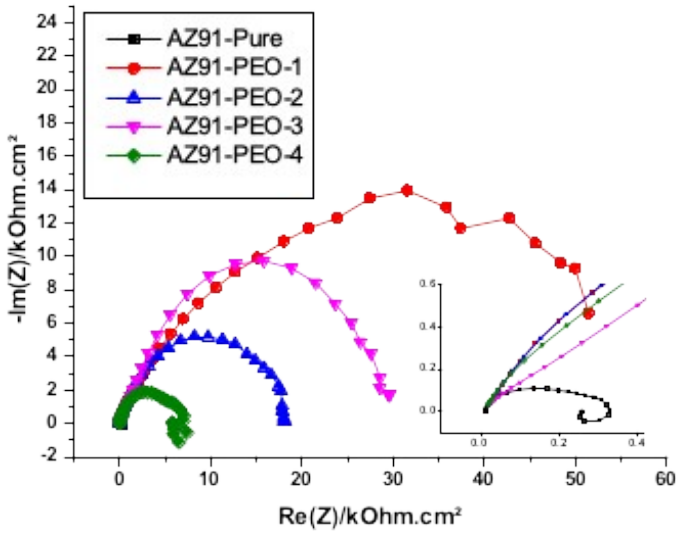

AZ91-PEO-4
Mold
No.6 16.78um
No.5 11.50um
No.1 21.26um
No.4 20.19um
No.2 17.78um
Coating
No.3 18.72um
Substrate
BED-C 20.0kV WD15.0mm High-P.C.80.0 100Pa x1,000 10um
By Eng.F.S.ALFADHL - KACST - NCIT Feb 04 2020

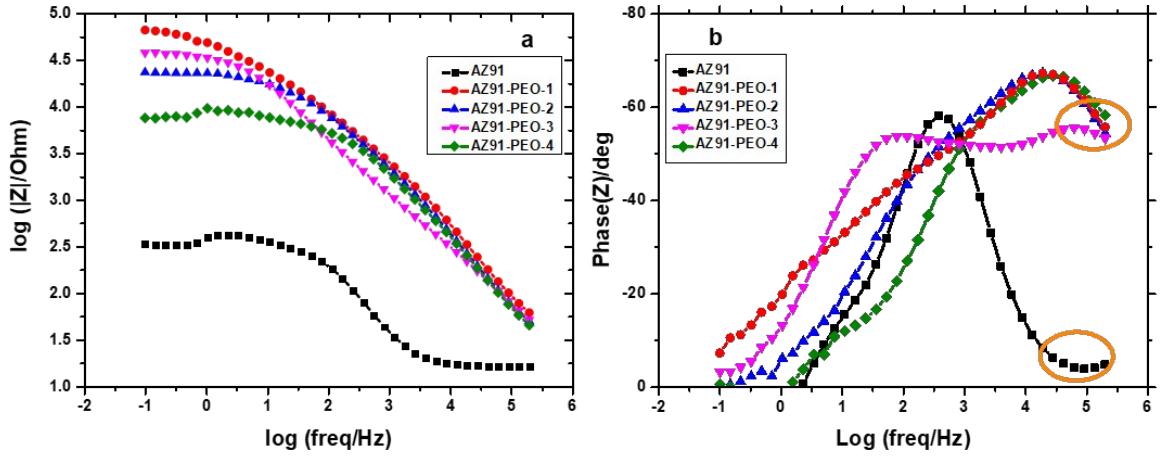

∗Mg •MgO ◊Mg(OH)2 oMgAl2O4 ♦ Mg17Al12
Intensity/ a.u
2θ/ degree
AZ91-PEO-4
AZ91-PEO-3
AZ91-PEO-2
AZ91-PEO-1
AZ91

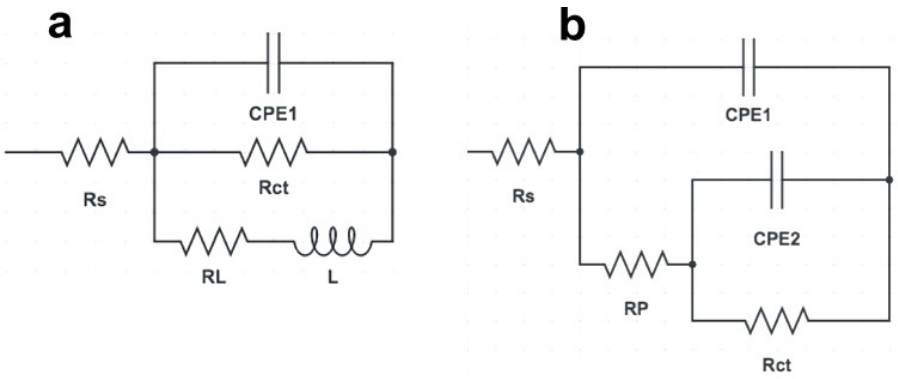

a
Intensity/a.u
2θ/degree
AZ91-PEO-4
AZ91-PEO-3
AZ91-PEO-2
AZ91-PEO-1
AZ91

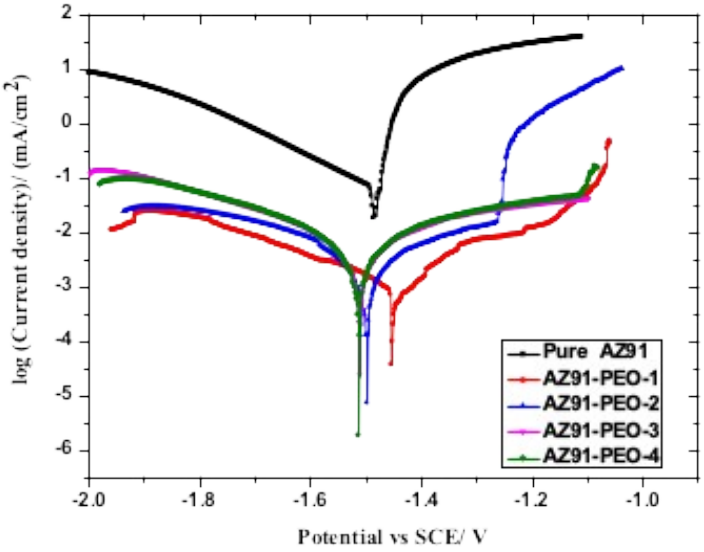

b
Intensity/a.u
2θ/degree
AZ91-PEO-4
AZ91-PEO-3
AZ91-PEO-2
AZ91-PEO-1
AZ91
X


Pure AZ91
AZ91-PEO-1
AZ91-PEO-2
AZ91-PEO-3
AZ91-PEO-4
Vvs.SCE/ (V)
Time/s
-1.48
-1.50
-1.52
-1.54
-1.56
-1.58
-1.60
-1.62
-1.64
0
1000
2000
3000
4000
5000
6000
7000
8000


AZ91-Pure
AZ91-PEO-1
AZ91-PEO-2
AZ91-PEO-3
AZ91-PEO-4
-Im(Z)/kOhm.cm²
Re(Z)/kOhm.cm²
24
22
20
18
16
14
12
10
8
6
4
2
0
-2
0
10
20
30
40
50
60


a
b
AZ91
AZ91-PEO-1
AZ91-PEO-2
AZ91-PEO-3
AZ91-PEO-4
log (|Z|/Ohm)
log (freq/Hz)
Phase(Z)/deg
Log (freq/Hz)


a
CPE1
Rs
Rct
RL
L
b
CPE1
Rs
CPE2
RP
Rct


log (Current density)/ (mA/cm2)
Potential vs SCE/ V
Pure AZ91
AZ91-PEO-1
AZ91-PEO-2
AZ91-PEO-3
AZ91-PEO-4

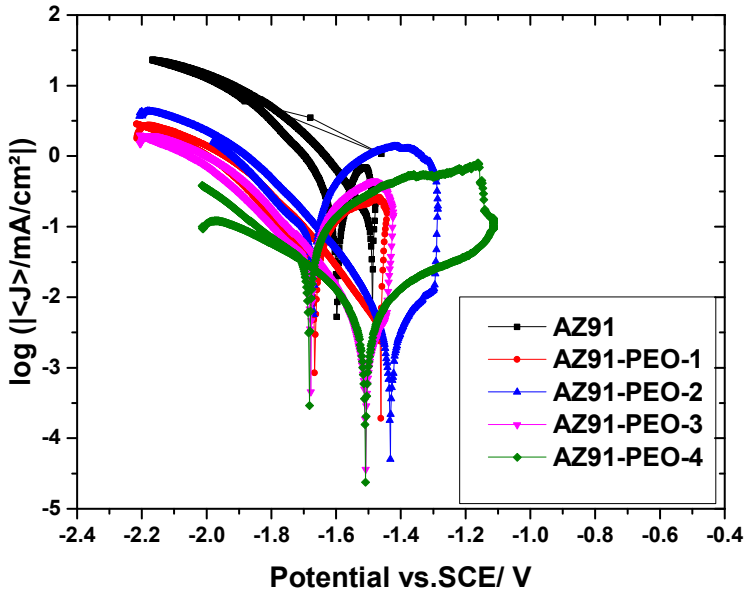


Figure1: Surface morphologies before (left) and after (right) corrosion test: pure AZ91 (a and b), AZ91-PEO 1 (c and d), AZ91- PEO 2 (e and f), AZ91- PEO 3 (g and h) and AZ91- PEO 4 (j and k).

Figure 2 SEM images and EDS analysis of as-received AZ91 after corrosion test examined in aerated 0.5M sodium chloride at 298 K.

Figure 3 Cross-section images of samples with different PEO coatings parameters.

Figure 4: XRD patterns for as-received AZ91 and different PEO coated samples.

Figure 5: Full spectrum of XRD patterns obtained from as-received AZ91 and PEO coated samples after electrochemical corrosion test examined in aerated 0.5M sodium chloride at 298 K (a), selected region from 26-40 2θ° to show the missing peak.

Figure 6: Open circuit potential versus time in the sodium chloride solution [0.5 M].

Figure 7: Nyquist plots of PEO coatings performance examined in 0.5 M of sodium chloride. The inset is the zoom-in impedance of the as-received AZ91.

Figure 8 Bode plots (a) log |Z| vs. log (freq/Hz), and (b) phase angle vs. log (freq/Hz) of AZ91 and PEO coatings performance examined in 0.5 M of sodium chloride.

Figure 9: The equivalent circuits model for, a: as-received AZ91, b: PEO coated alloys.

Figure 10: Potentiodynamic polarization curves of PEO coated samples carried out in 0.5 M sodium chloride.

Figure 11: Cyclic potentiodynamic polarization curves of coated AZ91 alloys in 0.5 M of NaCl solution.