

Supporting Information:

Electrodeposition of ZnNi Alloys From Choline Chloride-Ethylene Glycol

Deep Eutectic Solvent and Pure Ethylene Glycol for Corrosion Protection

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Figure S1 describes the electrochemical behaviour of pure ChCl/EG 1:2, ChCl/EG 1:4.5 and pure EG.

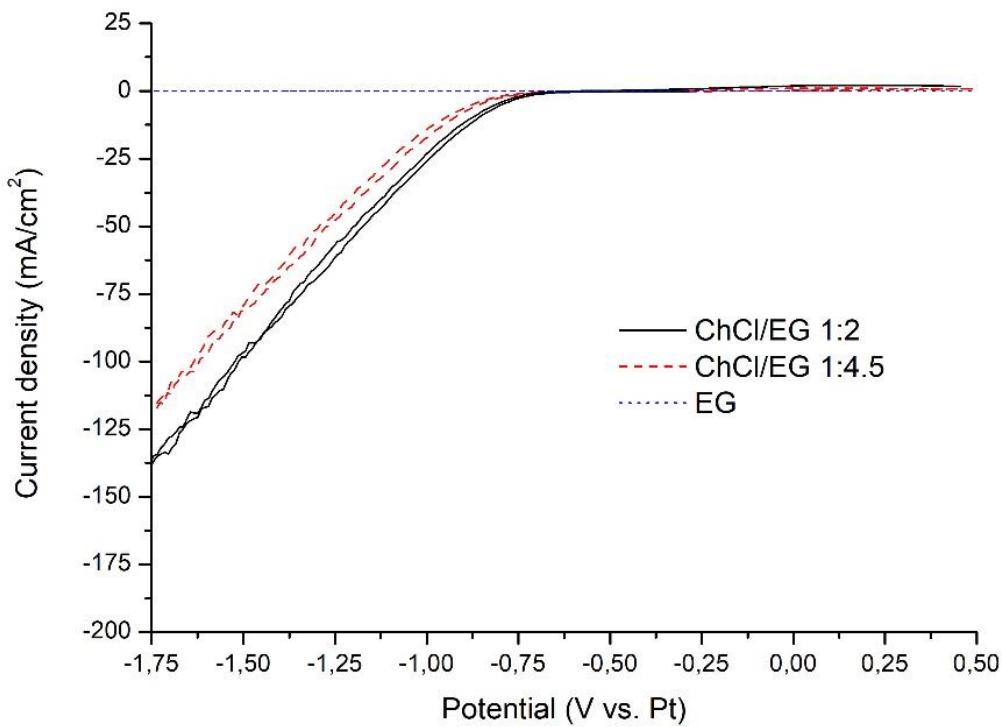


Figure S1. Cyclic voltammetries for ChCl/EG 1:2, ChCl/EG 1:4.5 and pure EG (20 mV/s).

Coherently with their high conductivity, ChCl/EG based electrolytes present high values of current density at low potentials. On the contrary, EG presents comparatively low currents.

Figure S2 shows the effect of Zn(II)/Ni(II) ratio on the electrochemical behavior of ZnNi_x electrolytes on ChCl/EG (a) and pure EG (b).

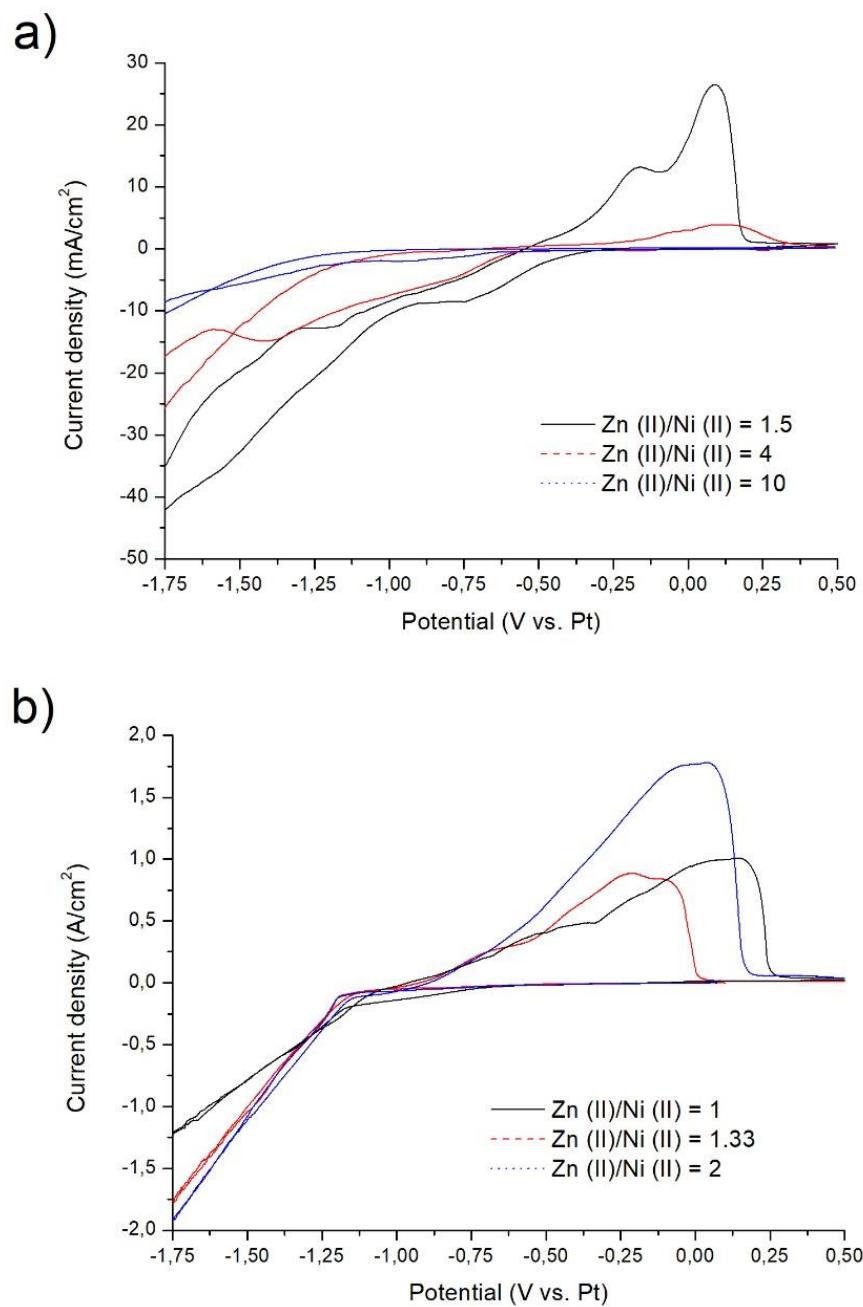


Figure S2. Cyclic voltammetries for ZnNi electrolytes based on ChCl/EG (a) and EG (b) containing different Zn(II)/Ni(II) ratios.

Table S1 reports the calculated XRD peaks for a ZnNi γ phase containing randomly placed Ni atoms. For some peaks, I_{rel} , d and 2θ are missing. In this case, the peak presents properties analogous to the peak listed immediately above.

Table S1. Calculated XRD peaks for a ZnNi γ phase containing randomly placed Ni atoms

h	k	l	I_{rel}	d (Å)	2θ (°)
1	1	0	3,177393	6,30222	14,0409
2	0	0	1,083735	4,456343	19,90716
2	1	1	2,914458	3,638588	24,4437
2	2	0	1,625265	3,15111	28,29833
3	1	0	2,248303	2,818438	31,72149
2	2	2	20,13068	2,572871	34,84139
3	2	1	7,331394	2,382015	37,7341
4	0	0	0,1484	2,228171	40,44913
3	3	0	100	2,10074	43,02088
4	1	1	-	-	-
4	2	0	5,110397	1,992937	45,4744
3	3	2	18,26947	1,900191	47,82861
4	2	2	14,36222	1,819294	50,09822
4	3	1	16,06079	1,747921	52,29499
5	1	0	-	-	-
5	2	1	5,025285	1,627226	56,50654
4	4	0	8,531428	1,575555	58,53588
5	3	0	10,91605	1,528513	60,52213
4	3	3	-	-	-
4	4	2	48,14255	1,485448	62,47019
6	0	0	-	-	-
6	1	1	16,20798	1,445828	64,3843
5	3	2	-	-	-
6	2	0	1,366402	1,409219	66,26821
5	4	1	0,917316	1,375257	68,12527
6	2	2	5,053912	1,343638	69,95846
6	3	1	15,42555	1,314104	71,7705
4	4	4	42,67233	1,286435	73,56384
5	5	0	37,25847	1,260444	75,34077
5	4	3	-	-	-
7	1	0	-	-	-
6	4	0	8,968557	1,235967	77,10339
5	5	2	40,11556	1,212863	78,85368
6	3	3	-	-	-
6	4	2	8,324695	1,191008	80,5935
7	3	0	7,439231	1,170293	82,3246
6	5	1	19,56613	1,131912	85,76736
7	3	2	-	-	-
8	0	0	12,49433	1,114086	87,48224
8	1	1	12,64788	1,097076	89,19486
5	5	4	-	-	-
8	2	0	24,44436	1,080822	90,90676
6	4	4	-	-	-
6	6	0	38,25549	1,05037	94,33453
8	2	2	-	-	-
7	5	0	2,355796	1,036079	96,0535
6	6	2	17,79841	1,022355	97,77794
7	5	2	12,9664	1,009163	99,50952

Figures S3 and S4 depict the SEM morphology of two ZnNi coatings plated from ChCl/EG or EG based solutions. Figure S3 refers to a ZnNi layer from ChCl/EG 1:2, observed at 1,000 X. Figure S5 refers to a ZnNi layer from EG, observed at 5,000 X.

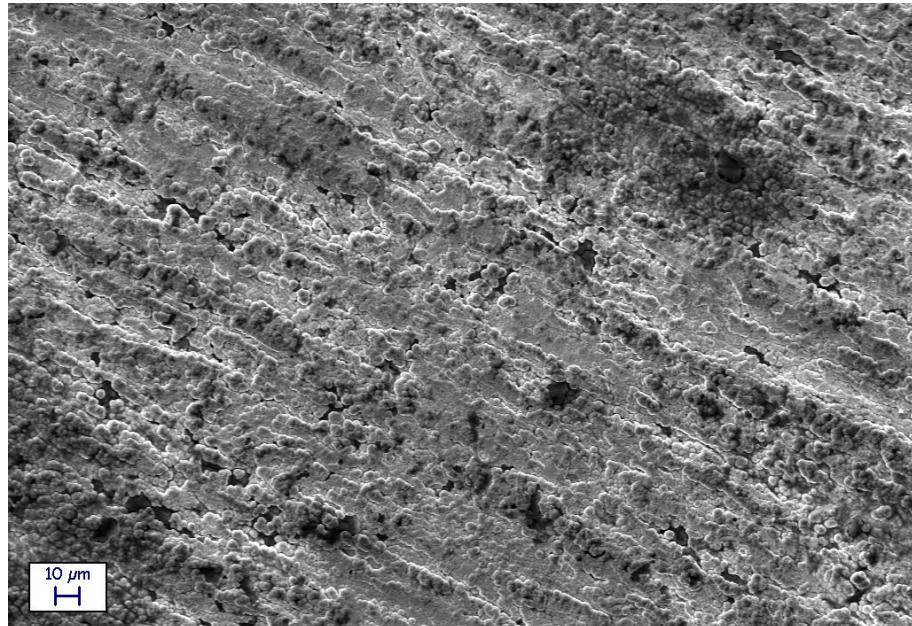


Figure S3. SEM of a ZnNi layer from ChCl/EG 1:2 (1,000 X).

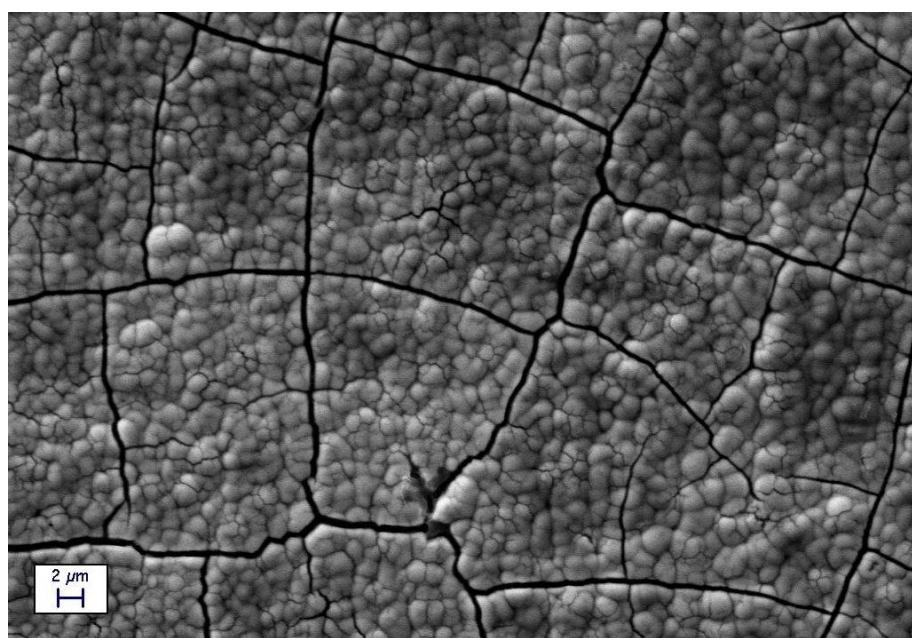


Figure S4. SEM of a ZnNi layer from EG (5,000 X).

Figure from S5 to S7 show the EDS (energy dispersive spectroscopy) analysis performed on the layers visible in figure 5 of the main manuscript. Figure S5 refers to figure 5a, figure S6 refers to figure 5b and figure S7 refers to figures 5c and 5d.

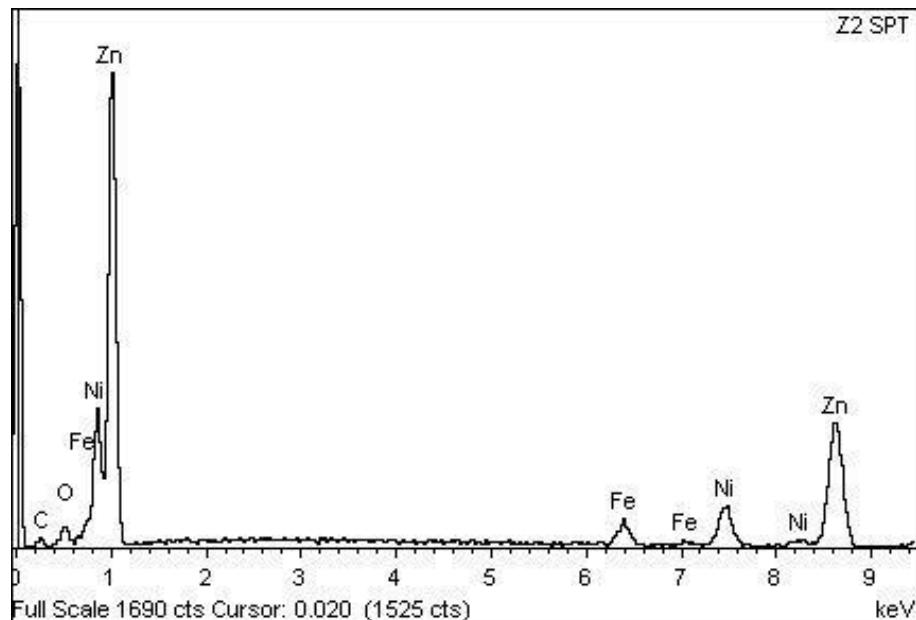


Figure S5. EDS analysis of a ZnNi layer plated from ChCl/EG 1:2.

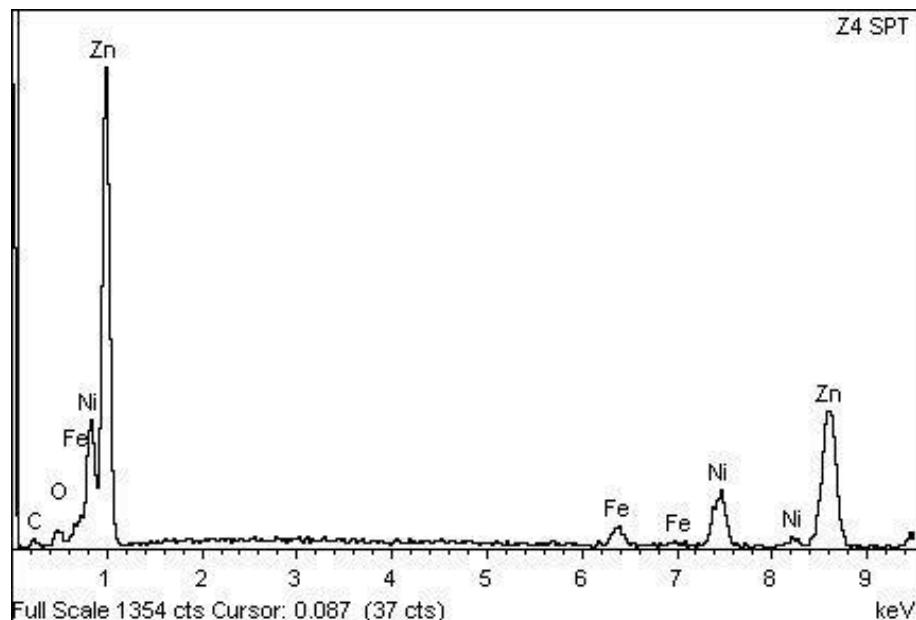


Figure S6. EDS analysis of a ZnNi layer plated from ChCl/EG 1:4.5.

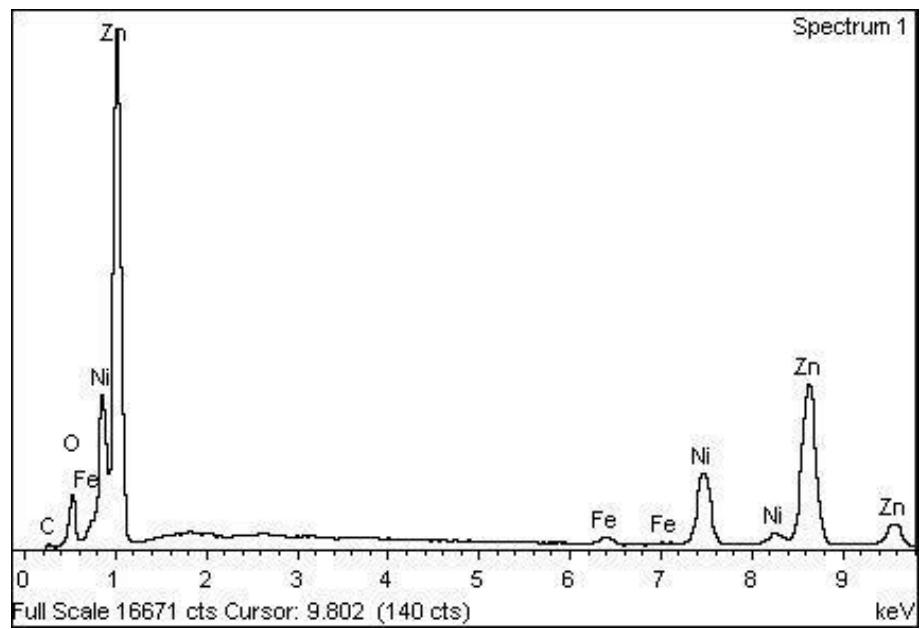


Figure S7. EDS analysis of a ZnNi layer plated from EG.

Absence of chloride contamination is evident in all the samples. A limited C and O contamination is present.