

# Importance of continuous and simultaneous monitoring of both electrode voltages during Discharge/Charge Battery tests. Application to Zn-based Batteries

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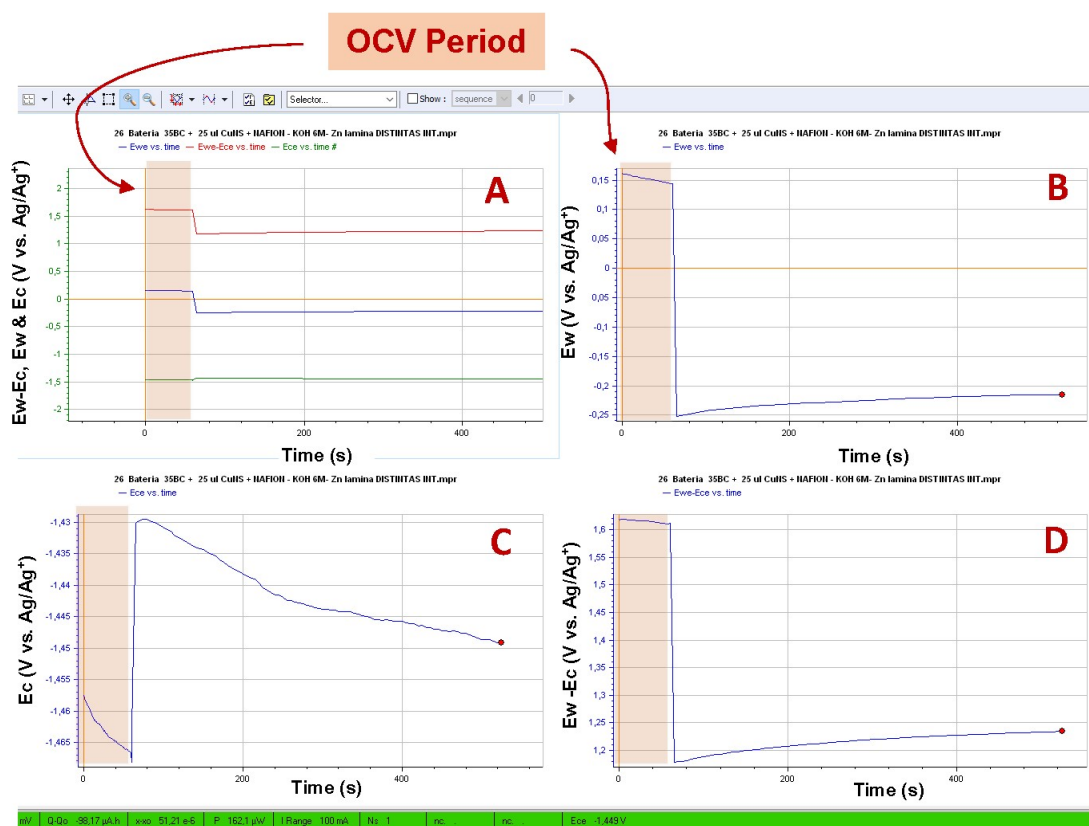


Figure S1. Screen Snapshot of the Ec-Lab software used in a Biologic VSP potentiostat/galvanostat taken during a galvanostatic discharge of a Zn/air battery showing the independent recording of  $E_w$ ,  $E_c$  and the  $E_w - E_c$  curves. A)  $E_w$ ,  $E_c$  and  $E_w - E_c$  curves vs. time in the same plot. B)  $E_w$  curve vs. time. C)  $E_c$  curve vs. time. D)  $E_w - E_c$  curve vs. time.

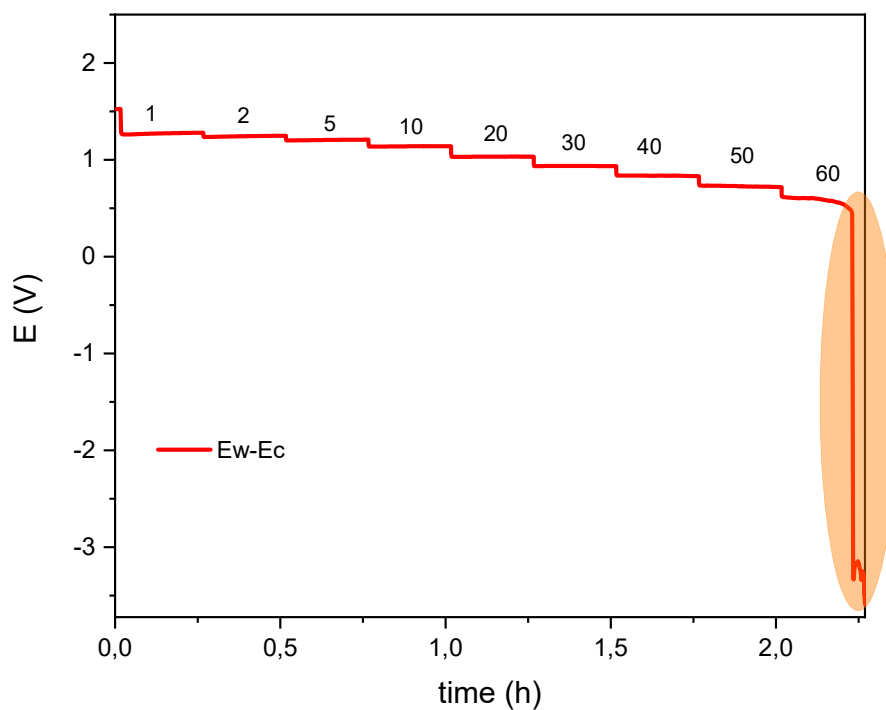


Figure S2.  $E_w - E_c$  curve obtained at different current density values during the discharge process of the Zn/air battery, highlighting the sudden fall at  $-60 \text{ mAcm}^{-2}$ .

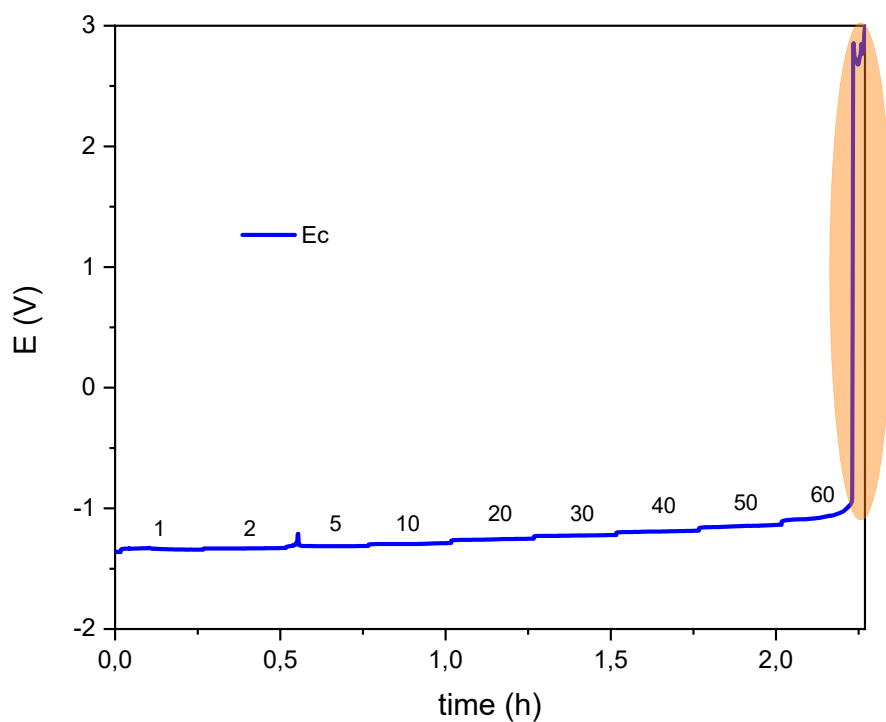


Figure S3.  $E_c$  curve obtained at different current density values during the discharge of the Zn/air battery, showing the abrupt rising of the potential at  $60 \text{ mAcm}^{-2}$ .

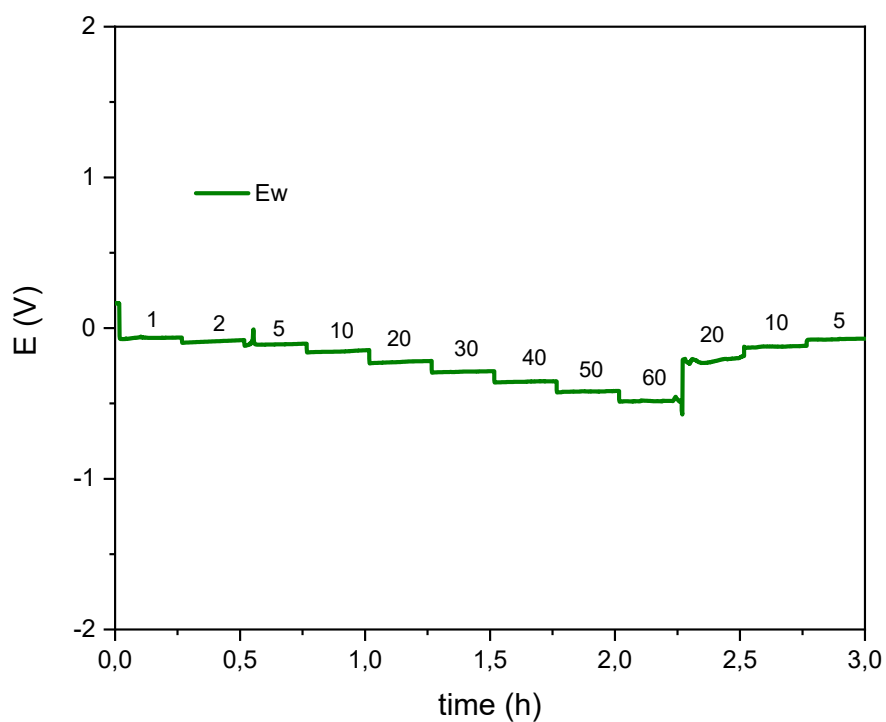


Figure S4.  $E_w$  curve obtained at different current density values during the discharge of the Zn/air battery

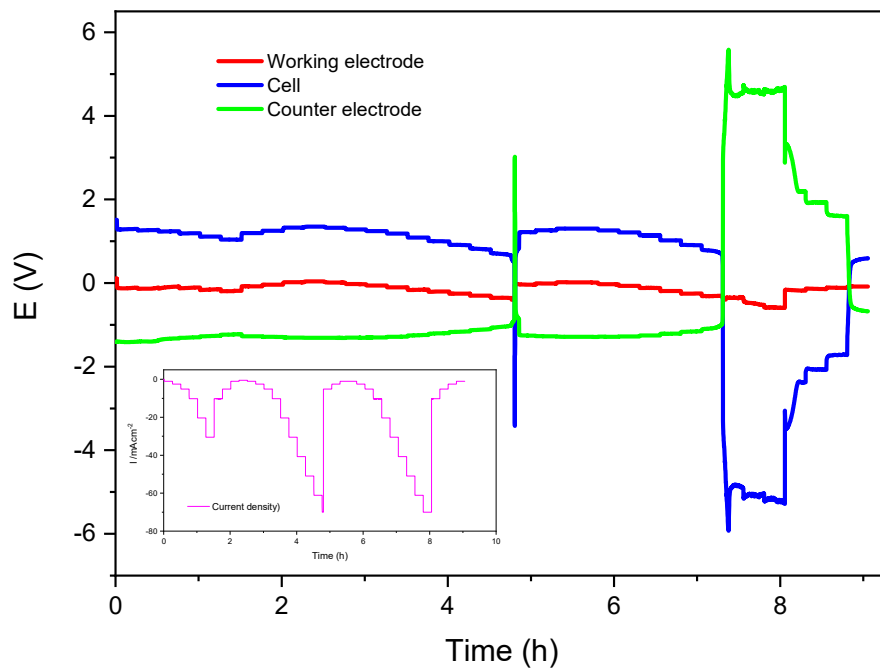
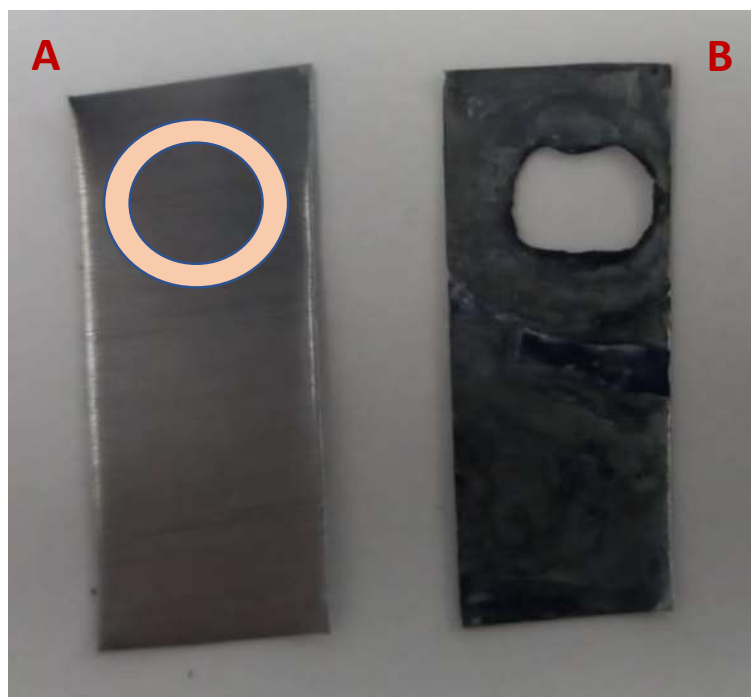
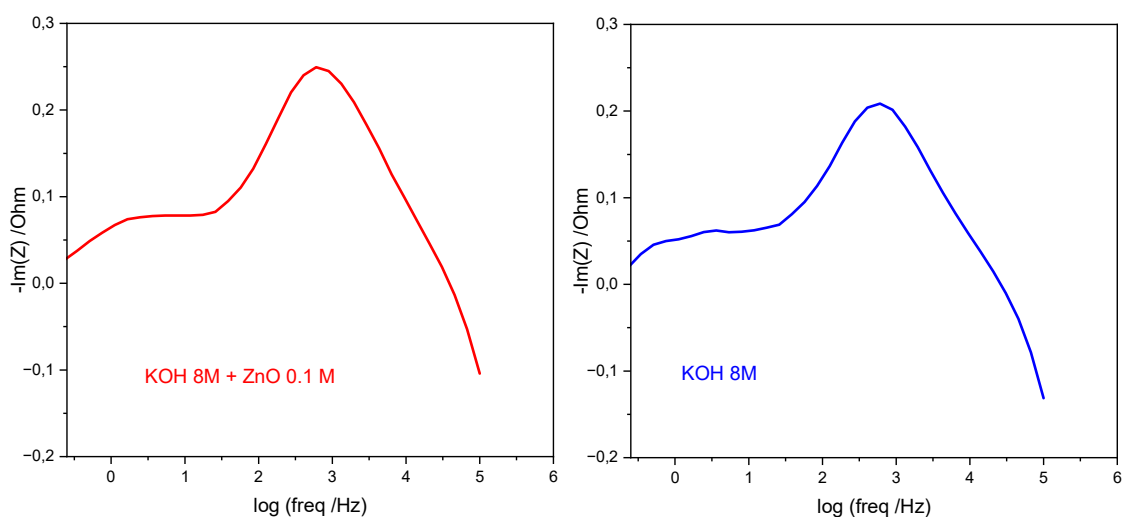


Figure S5. Galvanostatic discharge at several current density values.  $E_w$ ,  $E_c$  and  $E_w-E_c$  curves are displayed in the same plot.



**Figure S6.** (A) Pristine Zn plate and (B) Exhaust Zn electrode used in the Zn/8M KOH ( $\sim 1\text{mL}$ )/ $\text{Bi}_2\text{O}_3$  battery until battery failure. This electrode was employed in the battery results included in Figure 3 and 4. A rubber gasket has been drawn in Figure A to show the electrode area in contact with the electrolyte.



**Figure S7.**  $-\text{Im}(Z)$  vs.  $\log(\text{freq})$  for Zn/ $\text{Bi}_2\text{O}_3$  battery in both 8M KOH + 0.1 M ZnO and 8M KOH electrolytes. Only Ew curves are shown.