WiSE as a Solution to Challenges in Zinc-Air Batteries

Karoline de Freitas Ishida[1*], Breno Luiz de Souza[1], Vitor Leite Martins[1]

[1] Instituto de Química, Universidade de São Paulo

**e-mail: karolishida@usp.br*

Zinc-air ($Zn\text{-}O_2$) batteries are a promising technology for energy storage, but their commercial viability is limited by challenges such as zinc dendrite formation and parasitic reactions between the electrolyte and the environment. This work investigates a highly concentrated aqueous electrolyte of the "Water-in-Salt" (WiSE) type, composed of zinc acetate (10 m) and potassium acetate (15 m), as a solution to these issues, focusing on its application in $Zn\text{-}O_2$ systems [1]. The tests indicate a wide electrochemical window of approximately 2.5 V (0.0 V to 2.5 V vs. Zn/Zn^{2+}), as shown in Figure 1a. In symmetric zinc cells, the need for substrates to mitigate parasitic reactions was observed. As seen in Figure 1b, copper and carbon substrates (red and black curves) led to short-circuiting within a few hours, while the aluminum/carbon substrate (blue curve) provided greater stability for over 120 hours. Figure 1c shows characteristic oxidation and reduction peaks, indicating good reversibility of the zinc redox processes within the investigated potential range.

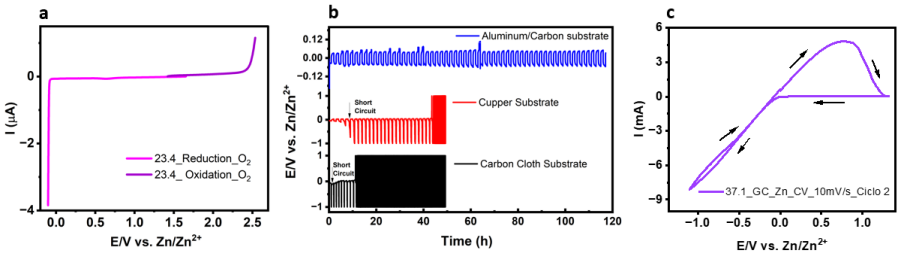

Figure 1. a) Linear sweep voltammetry (LSV) of the electrolyte using a glassy carbon electrode under oxygen atmosphere; b) Symmetric zinc coin cells with different substrates: Aluminum/Carbon, copper, and carbon cloth; c) Cyclic voltammetry (CV) of the glassy carbon electrode, cycle 2. All tests were performed using the WiSE electrolyte composed of 10 m zinc acetate and 15 m potassium acetate.

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References:

[1] Dong, D., Wang, T., Sun, Y., Fan, J., & Lu, Y. C. (2023). Hydrotropic solubilization of zinc acetates for sustainable aqueous Battery electrolytes. Nature Sustainability, 6(11), 1474–1484. https://doi.org/10.1038/s41893-023-01172-y