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Acid-Base Machine: Electrical Work from Neutralization Reactions

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Keywords: Prussian blue analogue, polycyanometallate, polyoxometalate, sodium ion insertion, proton insertion, neutralization pseudocapacitors.

SUPPLEMENTARY INFORMATION

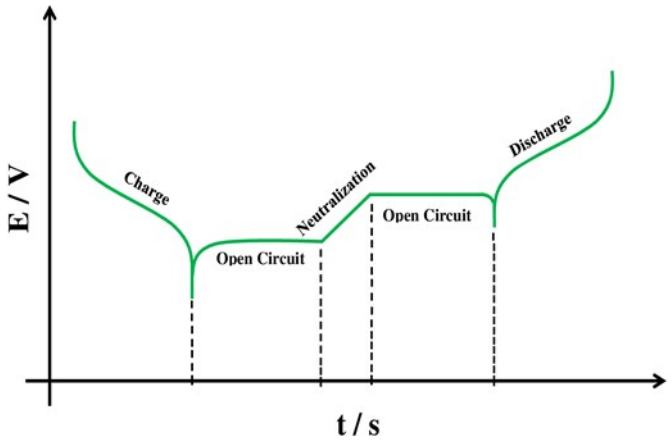

Figure 1s – Schematic representation of the experimental setup related to the charge (non-spontaneous) and discharge (spontaneous) steps of the full cell. The charge step of the full cell was performed in 20 mL of an electrolytic solution with HCl at pH = 1.1 and NaCl at pNa = 2. After that, the initial solution was exchanged for solutions composed of HCl, CH_3COOH, and NaOH at different proportions to simulate neutralization with the addition of NaOH. The discharge process was performed in solutions at pH = 2, 3, 4, 5, and 6 and pNa = 1.1. The electrochemical experiments were carried out in a homemade electrochemical cell containing two connections for input and output of the electrolytic solution; the solutions were exchanged by means of a four-channel peristaltic pump model BT100-1F.

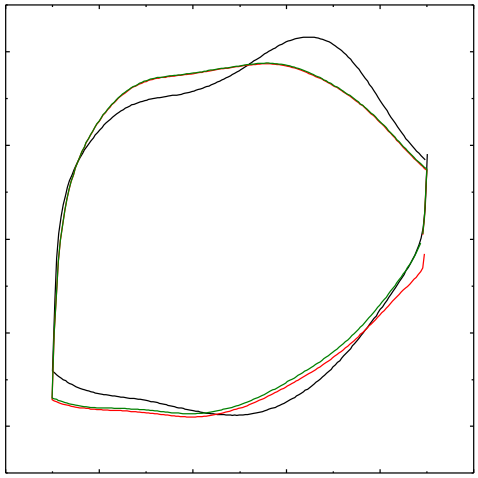

Figure 2s - Cyclic voltammograms of the first (—), second (—), and third (—) cycle of the CuHCF thin film in NaCl 1 mM electrolytic solution at pH = 1. $\nu = 10\ mV.s^{-1}$.

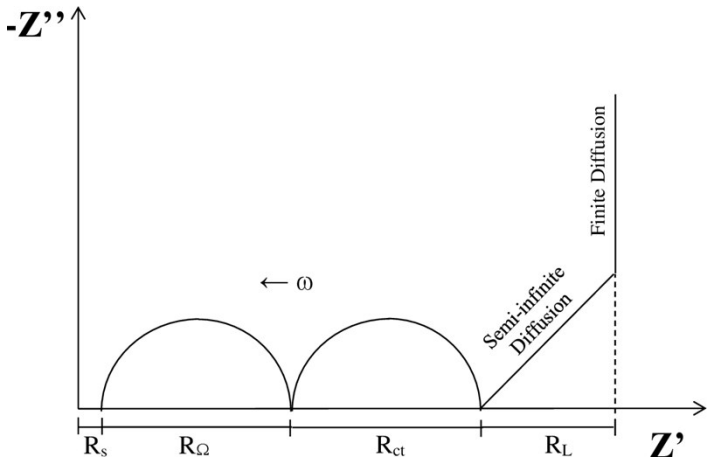

Figure 3s - Resistances determined from the intercept of the real axis (Z') from the Nyquist diagram. R_s is the sum of the resistances of the substrate and electrolytic solution, R_Ω is the host matrix resistance, R_{ct} is the charge transfer resistance, and R_L is the limiting resistance.