

Development of an adequate formation protocol for a non-aqueous potassium-ion hybrid supercapacitor (KIC) through the study of the cell swelling phenomenon

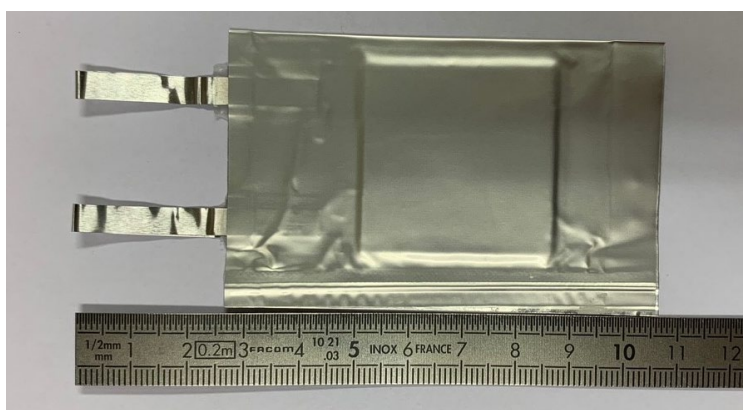


Figure S1. Pouch cell used for the tests.

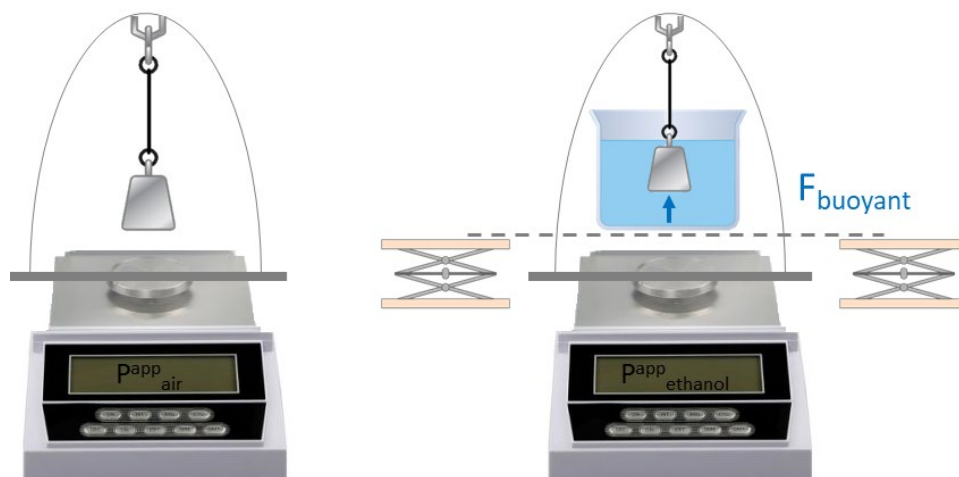
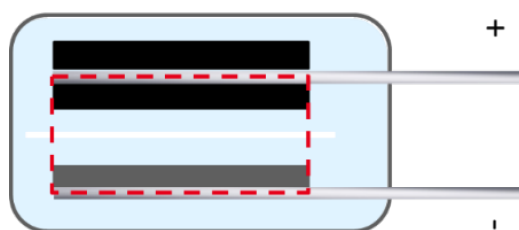


Figure S2. Experimental set-up carried out for volume measurements using Archimedes' principle

Electrochemical core definition:

For the electrochemical core, a half-current collector and the active and inactive materials on a surface of 12.25 cm^2 for the two electrodes, the separator on a surface of 12.25 cm^2 , and the electrolyte necessary to fill the pore volume electrodes and separator (for the parts taken into account in the calculation described above) are taken into account. A schematic representation of the electrochemical core within a sliced cell is shown below.



The electrochemical core considered for a hybrid KIC cell is 305.5 mg and 372.1 mg for a symmetrical EDLC cell.

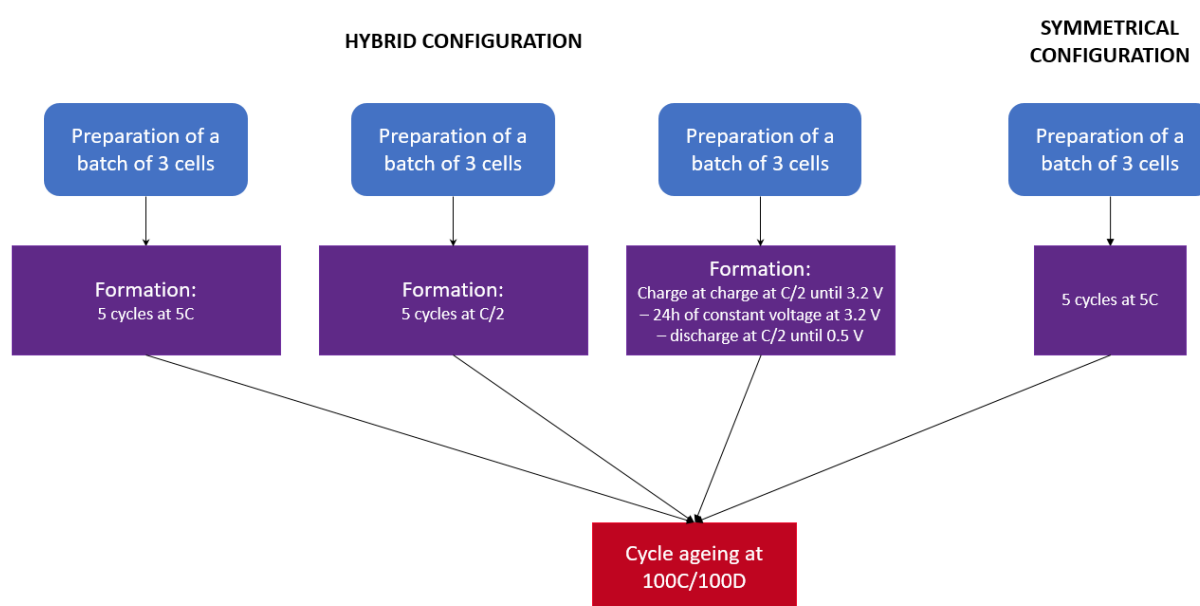


Figure S3. Flow chart of cycling tests conducted in this paper.

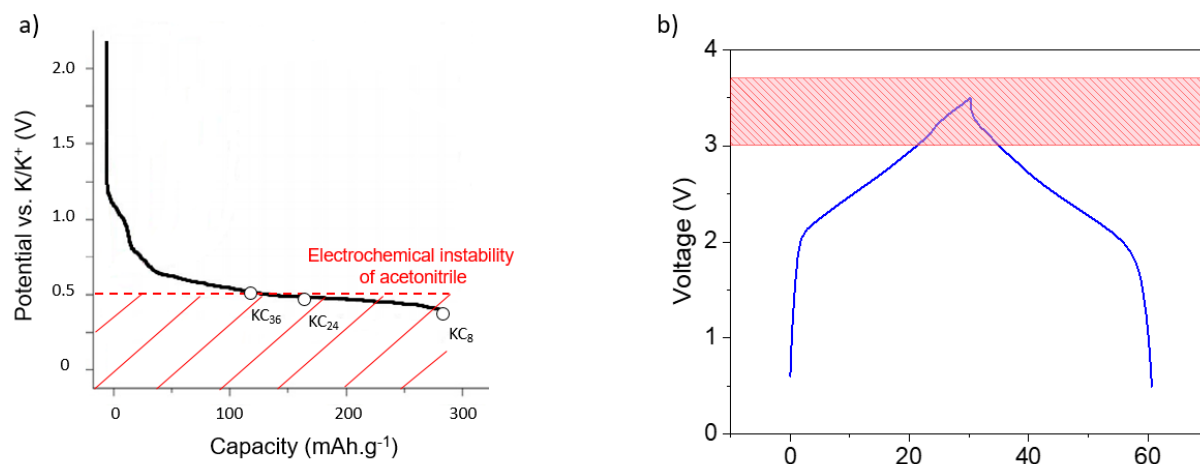


Figure S4. a) Schematic representation of potential profile vs. specific capacity of the negative electrode, and b) charge/discharge galvanostatic profile at 16 mA.cm⁻² (100C rate) of graphite/AC hybrid supercapacitor in pouch cell configuration using 0.8 mol.L⁻¹ KPF₆ AN at room temperature and ambient pressure

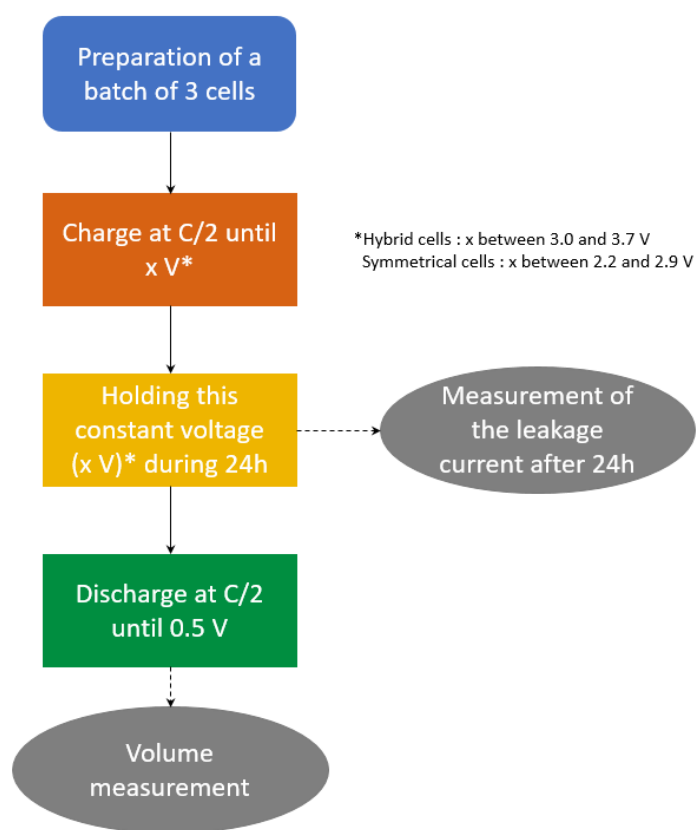


Figure S5. Flow chart of constant voltage tests conducted in this paper.

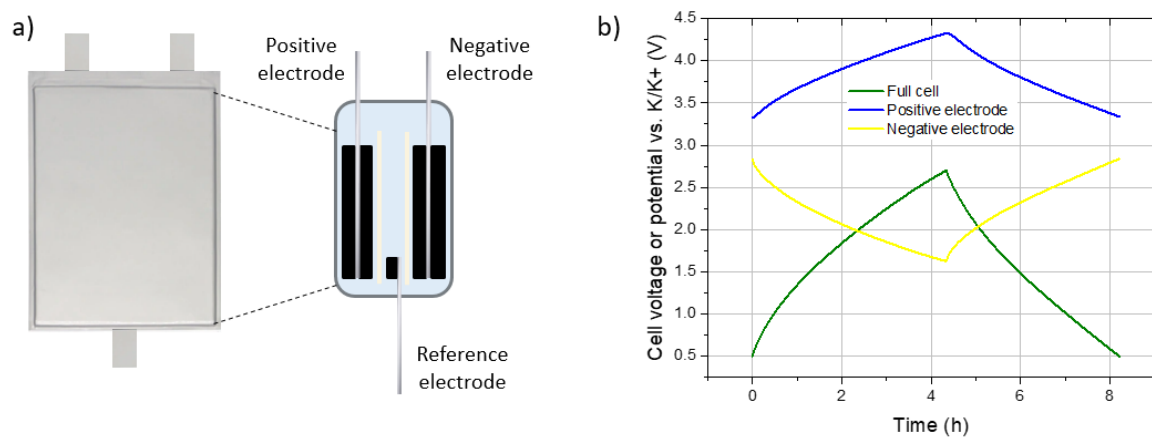


Figure S6. : a) Schematic representation of the three-electrode step-up, and (b) charge/discharge profiles at ± 0.08 mA.cm⁻² of an AC/AC supercapacitor in three-electrode cell configuration using 0.8 mol.L⁻¹ KPF₆ AN. The cell voltage (green) is measured while the reference electrode is used to calculate the potentials of the positive (blue) and negative (yellow) electrodes.

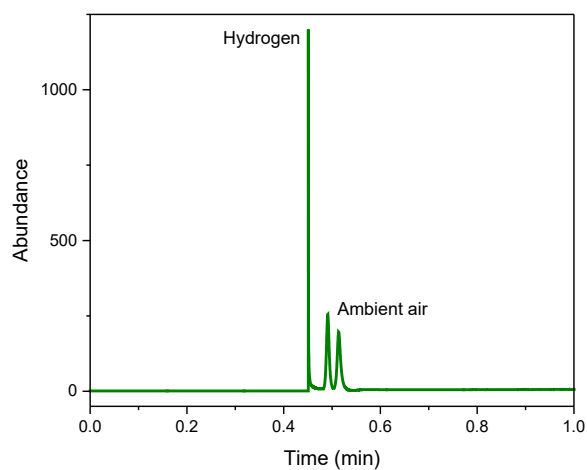


Figure S7. Chromatogram of gas extracted from aged graphite/AC hybrid cells using 0.8 mol.L⁻¹ KPF₆ AN.

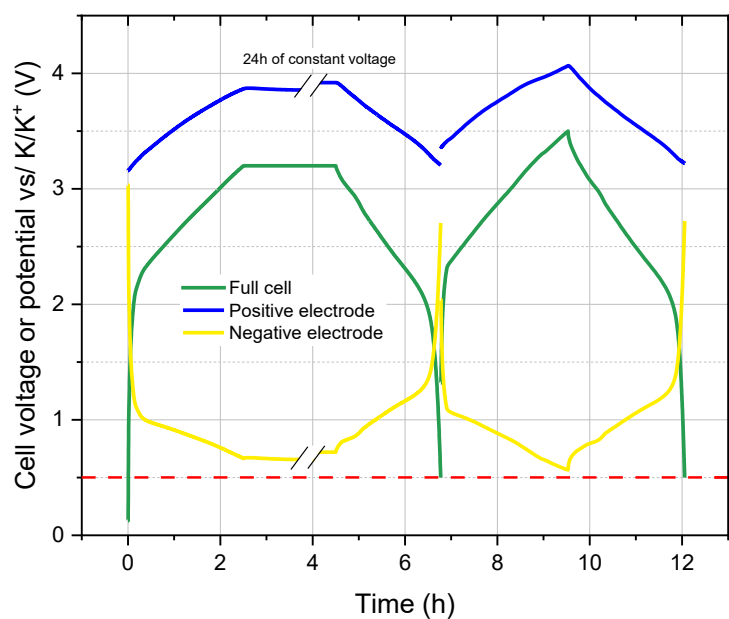


Figure S8. a) Cell voltage and electrode potentials profiles of graphite/AC hybrid supercapacitors in three-electrode set-up using $0.8 \text{ mol.L}^{-1} \text{ KPF}_6 \text{ AN}$ with a charge/discharge at $\pm 0.08 \text{ mA.cm}^{-2}$ and a 24-hour constant voltage step at 3.2 V, followed by a galvanostatic charge/discharge cycle at $\pm 0.08 \text{ mA.cm}^{-2}$.