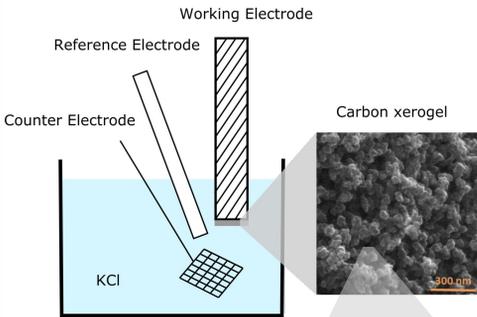
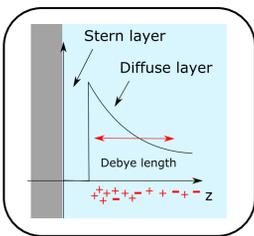
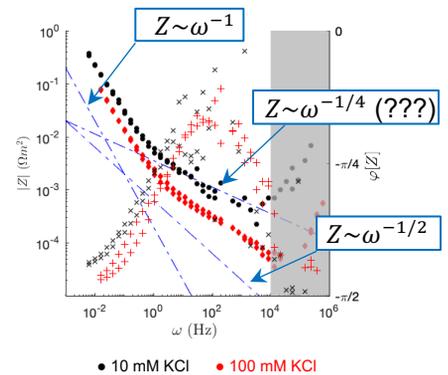


Experimental setup and impedance data



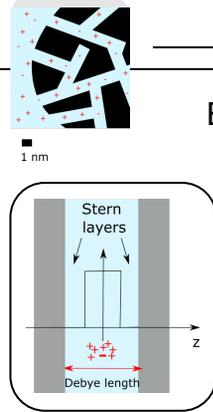
The impedance probes the behavior of electrical charges (electrons and ions) in the electrode:

- Equilibrium distribution at low frequency. Capacitive behavior expected, with $Z \sim \omega^{-1}$;
- Transport limitations at high frequency. Warburg-like behavior expected, with $Z \sim \omega^{-1/2}$.



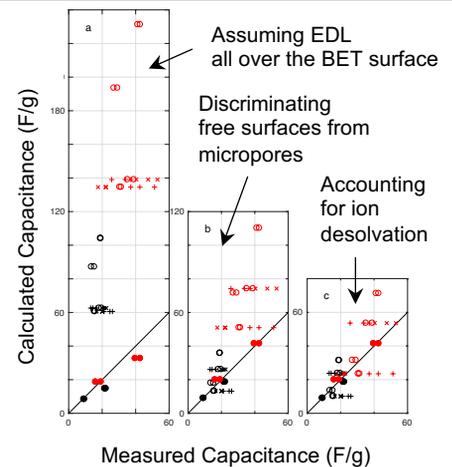
Different charge storage mechanisms:

- Electrical Double Layer (EDL) on surfaces;
- Donnan potential in micropores



Equilibrium charge storage (at the smallest scale)

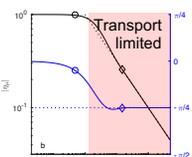
Based on the characterization of the porous carbons (nitrogen adsorption and mercury intrusion), the capacitances are well explained by a model that accounts for (i) an EDL on surfaces, (ii) a Donnan model in the micropores, and (iii) partial ion desolvation in micropores.



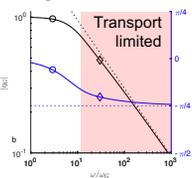
Charge transport limitations at all relevant scales of the electrode

At each scale, the capacitance has to be corrected by a frequency-dependent effectiveness factor.

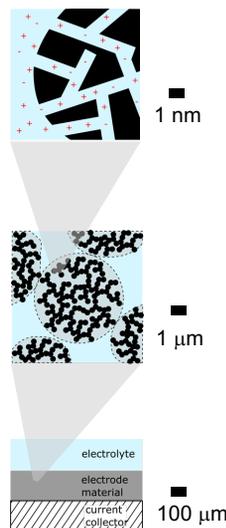
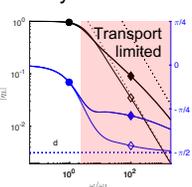
- in the micropores



- in the grains



- in the layer



Each scale of the electrode (micropores, grains, layer) has a characteristic frequency, above which charge transport is rate-limiting. The $Z \sim \omega^{-1/4}$ scaling corresponds to a frequency range where transport is rate-limiting both at the layer and at the grain scales.

