Supporting Information

Capacitive Storage at Nitrogen Doped Amorphous Carbon Electrodes: Structural and Chemical Effects of Nitrogen Incorporation

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S1. Thickness determinations for a-C and a-C:N thin film electrodes

The thickness of deposited films was determined using spectroscopic ellipsometry according to previously reported protocols.\textsuperscript{1-3} Briefly, the a-C or a-C:N electrode was modelled as a 3-layer structure incorporating the underlying Si wafer substrate, native oxide layer and thin film. The complex index of refraction and thickness of the carbon layer were parameterized using B-Splines which have previously been used to accurately determine bulk optical properties and film thicknesses on amorphous carbon materials.\textsuperscript{4} The resulting thicknesses in each case were normalised by the constant deposition time of 40 minutes to obtain a deposition rate in nm min\textsuperscript{-1} as a function of the N\textsubscript{2} % in the sputtering chamber as reported in Figure S1.

![Graph showing deposition rate vs. N\textsubscript{2} % in the chamber](image)

**Figure S1.** Deposition rate obtained from spectroscopic ellipsometry determinations for a-C\textsuperscript{1} and a-C:N materials\textsuperscript{3} as a function of N\textsubscript{2} % flow in the deposition chamber under conditions identical to those of our experiments.
S2. Nyquist plots in aqueous 0.1 M KCl

Figure S2 shows Nyquist plots of the a-C and a-C:N electrodes whose capacitance is reported in Figure 6 in the main text; the plots show data at three potentials near the capacitance minima.

![Nyquist plots](image)

**Figure S2.** Nyquist plots of EIS spectra of a-C, a-C:N-2%, a-C:N-5%, a-C:N-10% in aqueous 0.1 M KCl at (a) 0.0 V, (b) 0.2 V and (c) 0.4 V vs. Ag/AgCl.

S3. Cyclic voltammograms in 0.1 M TBAPF₆

Figure S3 shows cyclic voltammograms of a-C and a-C:N electrodes in 0.1 M TBAPF₆ in acetonitrile at varying scan rate.

![Cyclic voltammograms](image)

**Figure S3.** Cyclic voltammograms of a-C:N-2%, a-C:N-5% and a-C:N-10% electrode in 0.1 M TBAPF₆/acetonitrile at varying scan rates. No Faradaic peaks are visible in the potential window used for our experiments.
S4. Nyquist plots in aqueous 0.1 M TBAPF$_6$

Figure S4 shows Nyquist plots of the a-C and a-C:N electrodes whose capacitance is reported in Figure 7 in the main text; the plots show data at three potentials near the capacitance minima.

![Nyquist plots](image)

**Figure S4.** Nyquist plots of EIS spectra of a-C, a-C:N-2%, a-C:N-5%, a-C:N-10% in 0.1 M TBAPF$_6$ in acetonitrile at (a) 0 V, (b) 0.2 V and (c) -0.2 V vs. Ag$^+$/Ag.

References

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