Electronic Supplementary Information - ESI

Nanoscale Phase Separation in Laponite/Polypyrrole Nanocomposites. Application to Electrodes for Energy Storage

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Figure ESI 1. Film mass determination from SEM micrograph: a) SEM image using Energy selective Backscattered (EsB) detector. Image was thresholded by ImageJ software to create binary images, polymer (red) and Laponite rich-areas (white). b) Surface analysis.

If we assume a uniform film, the film mass can be calculated according to the following equation:

\[ m = S \times t \times \left\{ \phi \times \rho_{\text{Polyrrole}} + (1 - \phi) \times \rho_{\text{Laponite}} \right\} \]

where \( S \) and \( t \) were the area and the thickness, \( \phi \) the final volume fraction of polypyrrole inside the film, and \( \rho \) is the density. Density’s values are: 1.54 g cm\(^{-3}\) for polypyrrole\(^{[1]}\) and 2.54 g cm\(^{-3}\) for Laponite.

Figure ESI 2 (a) STEM micrograph obtained on thin film areas prepared on a Ni-TEM grid. Notice the T-type bonding between the laponite particles, e.g. readily visible in the center of the micrograph SEM. Micrograph using Energy selective Backscattered (EsB) detector of Lp-PPy-10% nanocomposite film: (b) Top view; (c) Cross section;
Figure ESI 3. AFM images of Lp-PPy-10% nanocomposite film using the force modulation modus: (a) height, and (b) amplitude and (c) phase. All scans are 1x1$\mu$m$^2$. Notice the meandering polymer phase (dark areas in b and c).
Figure ESI 4. (a) CVs of Lp-PPy nanocomposite electrodes at 50mV scan rate; (b) The charge–discharge curves at 3Ag⁻¹.
Figure ESI 5. Long-term cycling test (500 cycles) at a current density of 5 A/g for: (a) Lp film and (b) Lp-PPy-10% nanocomposite film.