

*Supplementary Information for*

## High performance PEDOT/Lignin biopolymer composites for electrochemical supercapacitors

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### Figures

#### Lignin quantification

Calibration curve of lignin was obtained by measuring the absorbance of different lignin standards with concentrations between 0.0025 and 0.20 g/L, as shown in Figure S1. A significant correlation between the absorption and lignin concentrations was obtained on the concentration range of lignin tested.

The measured absorbance at 202 nm of PEDOT/Lig dispersions was used with the calibration curve to calculate final lignin concentration on the dispersions. As a result, final PEDOT/Lig ratio was calculated.

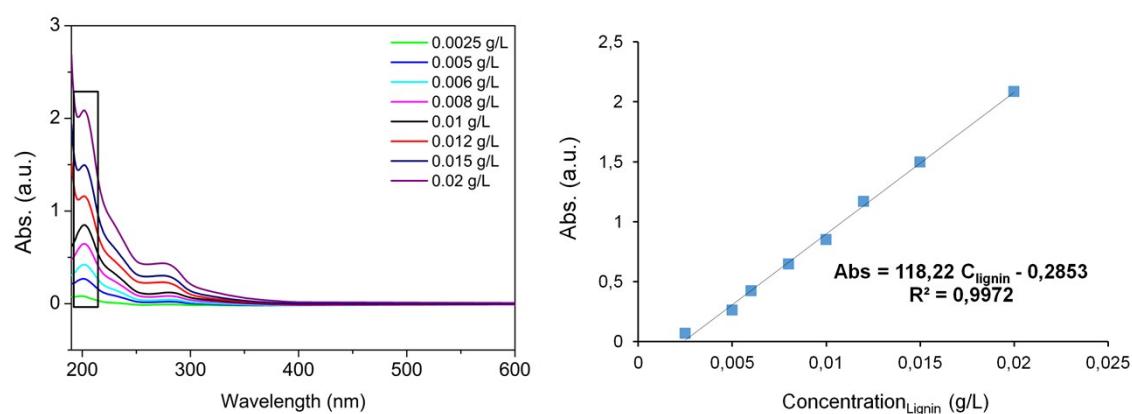


Figure S1. Calibration curve of lignin at 202 nm wavelength.

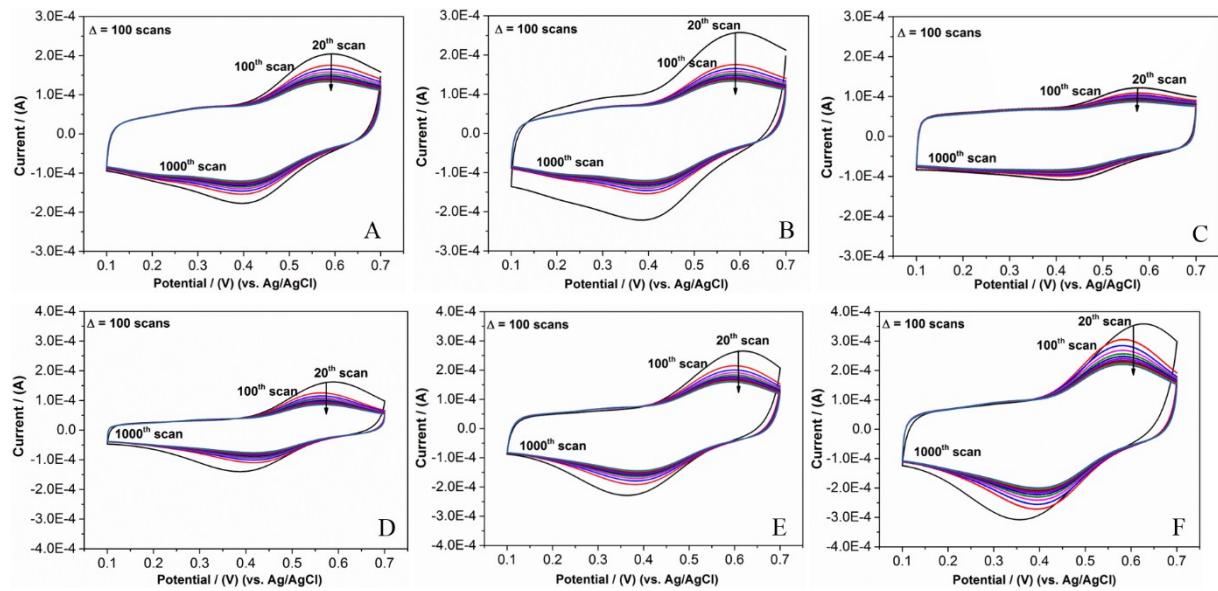


Figure S2. Cyclic voltammograms of PEDOT/Lig composites: chemically polymerized (A) 3:2, (B) 7:4, (C) 6:1 and electrochemically polymerized (D) 300 s, (E) 600 s, (F) 900 s.

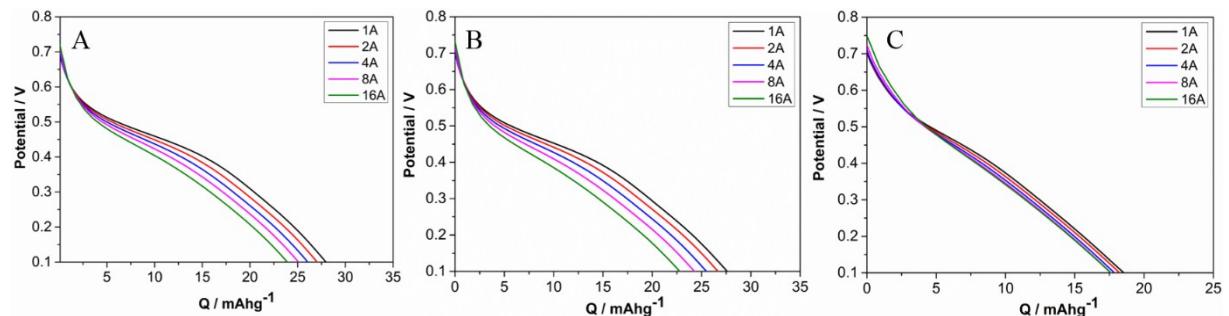


Figure S3. Discharge curves of PEDOT/Lig composites (A) 3:2, (B) 7:4, (C) 6:1 at different currents.

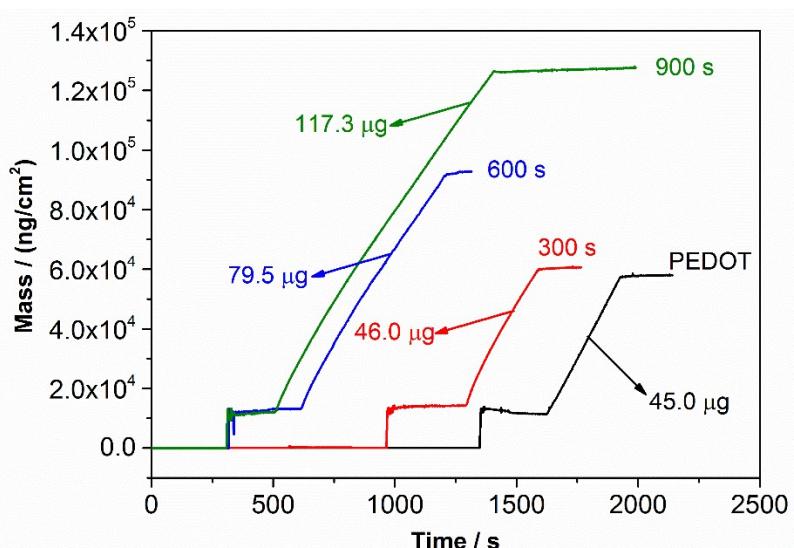


Figure S4. Mass changes obtained for the electrochemical polymerized PEDOT/Lig composites and PEDOT.

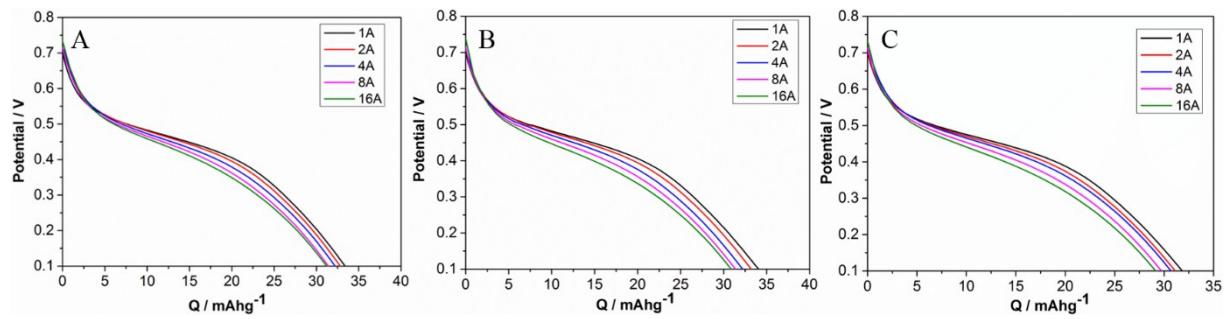


Figure S5. Discharge curves of PEDOT/Lig composites (A) 300 s, (B) 600 s, (C) 900 s at different currents.

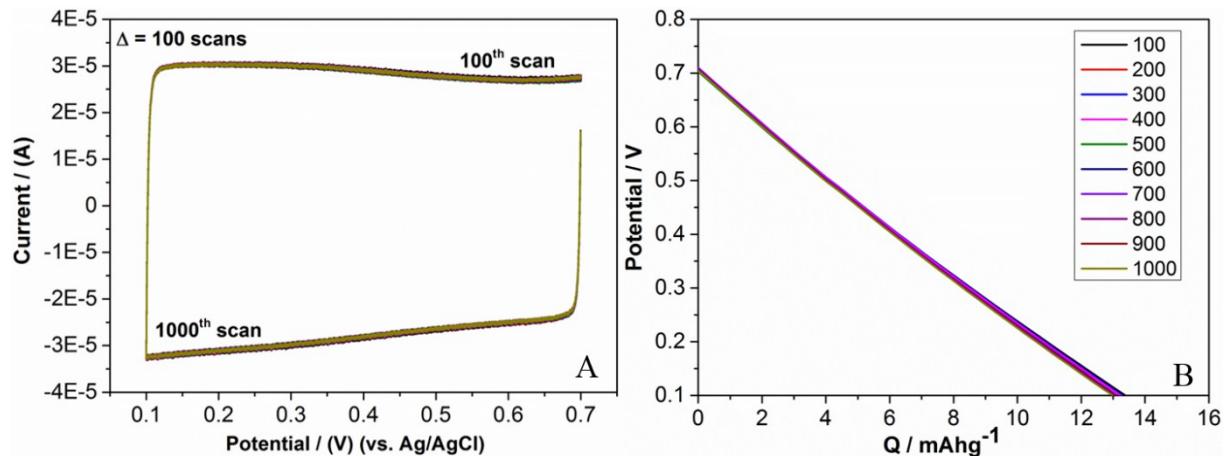


Figure S6. (A) Cyclic stability and (B) corresponding discharge curves of PEDOT.

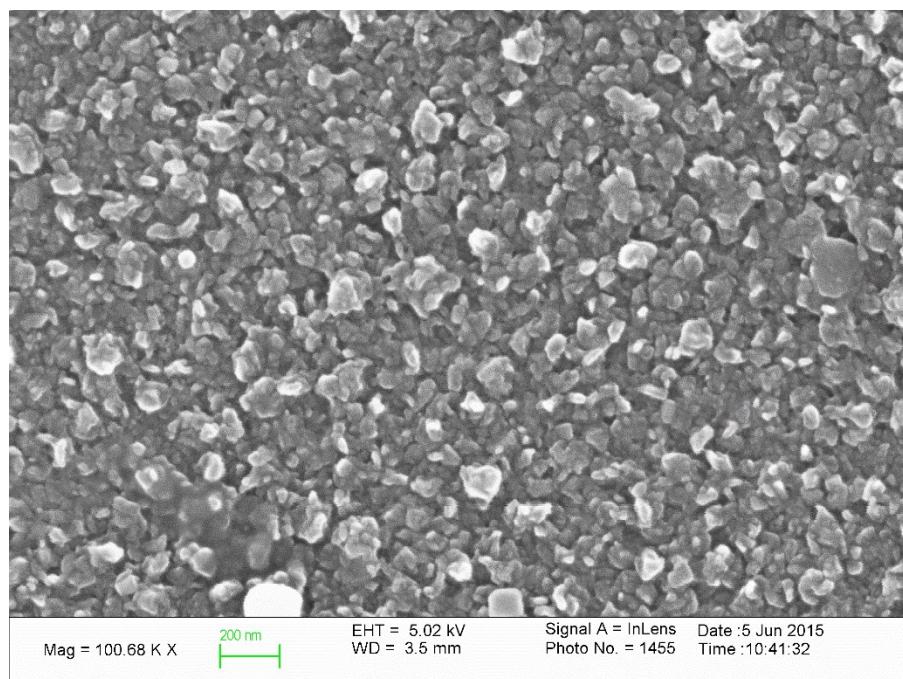


Figure S7. SEM image of PEDOT.

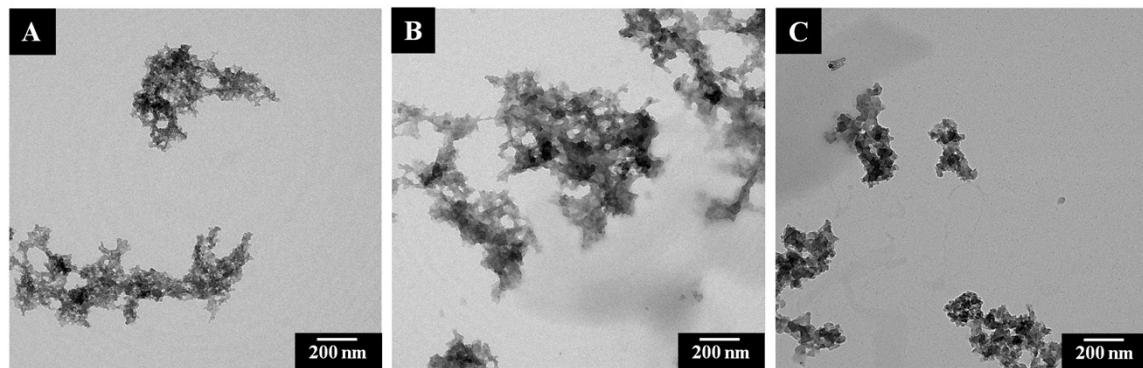


Figure S8. TEM images of PEDOT/Lignin composites chemically polymerized with the following EDOT:Lignin mass ratios (a) 3:2; (b) 7:4; (c) 6:1.

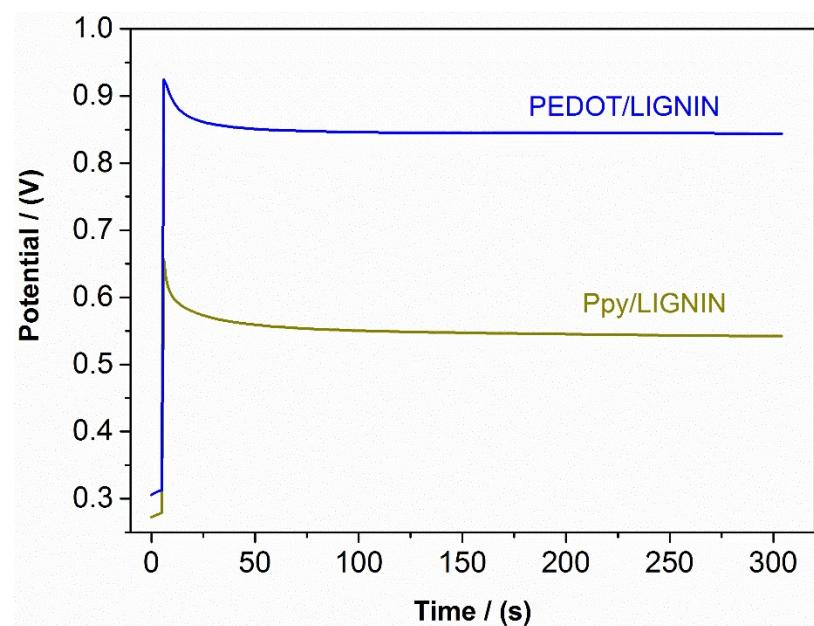


Figure S9. Galvanostatic electrochemical polymerization of PEDOT/Lig and Ppy/Lig.

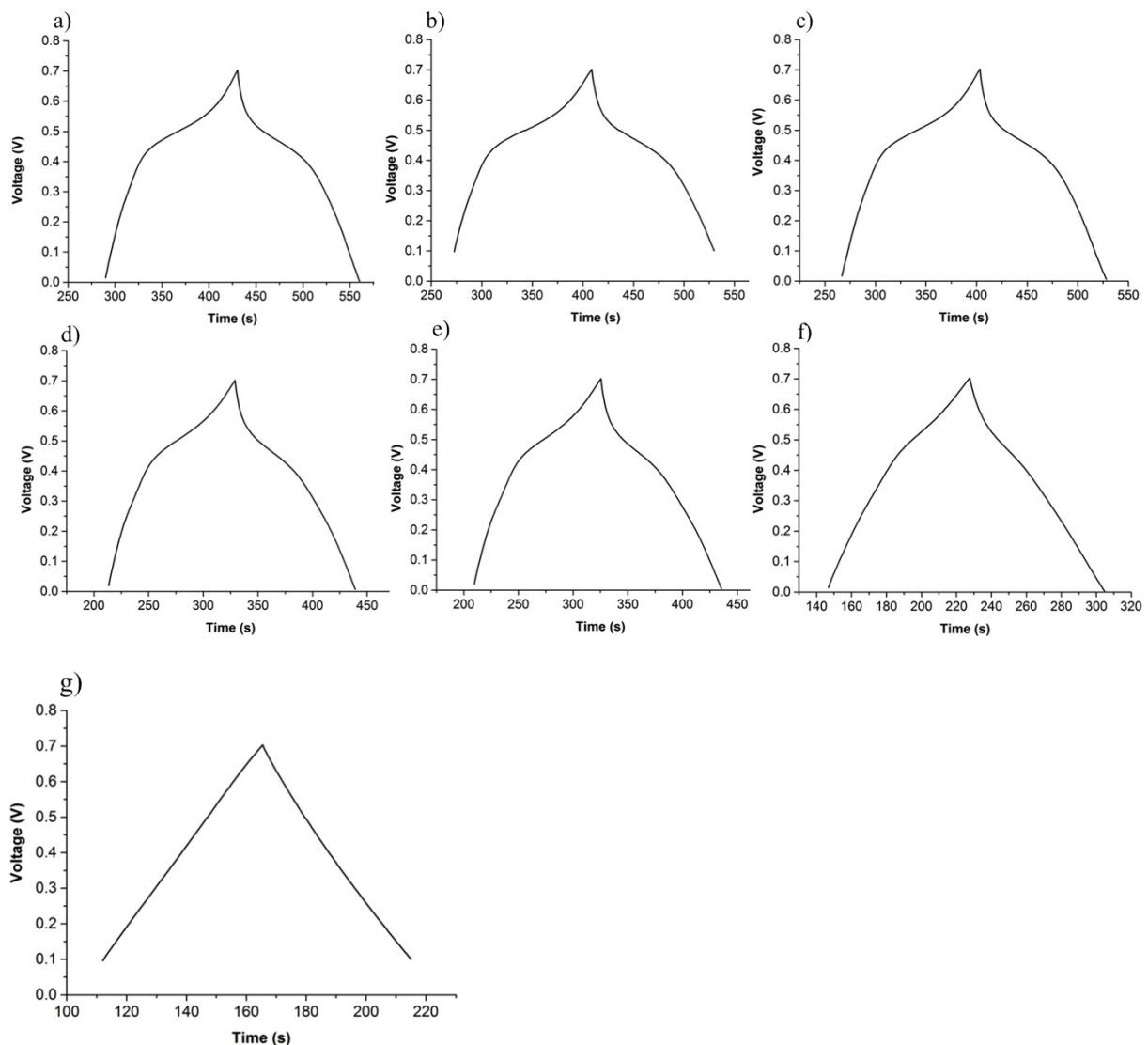


Figure S10. Galvanostatic charge discharge profiles of PEDOT/Lignin composites electrochemically polymerized composites at different deposition times: (a) 300 s; (b) 600 s and (c) 900 s, chemically polymerized with the following EDOT:Lignin mass ratios (d) 3:2; (e) 7:4; (f) 6:1 and (g) PEDOT electrochemically polymerized at current density of 1 A g<sup>-1</sup>.